



## FCC Part 15.247

**RSS-247 Issue 2, Feb 2017; RSS-Gen Issue 5, Mar 2019**

### TEST REPORT

For

**RADICOM RESEARCH, INC.**

679 EAST BROKAW ROAD, SAN JOSE, CA 95112-1005 United States

**FCC ID: K7T-RW8300M  
IC: 2377A-RW8300M**

<b>Report Type</b>	Original Report
<b>Product Name:</b>	2.4G WiFi+BT4.2(BLE) module
<b>Model Name</b>	<b>FCC: RW8300E-NL ISED: RW8300E-NL</b>
<b>Series Model Name</b>	<b>FCC: RW8300NE-a; RW8300NE-a-NL; RW8300E-B1; RW8300E-B2; RW8300E-B3; RW8300E; RW8300E-B3-NL ISED: RW8300E, RW8300E-B3, RW8300E-B3-NL</b>
<b>Report Number :</b>	<b>RLK190822001-00A</b>
<b>Report Date :</b>	<b>2019/11/20</b>
<b>Reviewed By :</b>	<b>Zeus Chen</b>
<b>Prepared By:</b>  Bay Area Compliance Laboratories Corp.(Linkou Laboratory) No. 6, Wende 2Rd., Guishan Dist., Taoyuan City 33382, Taiwan (R.O.C.) Tel: +886 (3)3961072; Fax: +886 (3) 3961027 <a href="http://www.bacl.com.tw">www.bacl.com.tw</a>	<i>Zeus Chen</i>

**Note:** This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Linkou Laboratory)

## Revision History

Revision	Report Number	Issue Date	Description
1.0	RLK190822001-00A	2019/11/20	Original Report

## TABLE OF CONTENTS

<b>1 GENERAL INFORMATION .....</b>	<b>5</b>
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	5
1.2 OPERATION CONDITION OF EUT.....	6
1.3 OBJECTIVE AND TEST METHODOLOGY.....	7
1.4 MEASUREMENT UNCERTAINTY .....	7
1.5 TEST FACILITY.....	7
<b>2 SYSTEM TEST CONFIGURATION.....</b>	<b>8</b>
2.1 TEST CHANNELS AND DESCRIPTION OF WORST TEST CONFIGURATION.....	8
2.2 SUPPORT EQUIPMENT LIST AND EXTERNAL CABLE LIST .....	9
2.3 BLOCK DIAGRAM OF TEST SETUP .....	9
2.4 DUTY CYCLE.....	10
<b>3 SUMMARY OF TEST RESULTS.....</b>	<b>11</b>
<b>4 FCC§15.247(I), §1.1310, § 2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE).....</b>	<b>12</b>
4.1 APPLICABLE STANDARD.....	12
4.2 RF EXPOSURE EVALUATION RESULT.....	13
<b>5 RSS-102 SEC 2.5.2- EXEMPTION LIMITS FOR ROUTINE EVALUATION – RF EXPOSURE EVALUATION .....</b>	<b>14</b>
5.1 APPLICABLE STANDARD.....	14
5.2 RF EXPOSURE EVALUATION RESULT.....	14
<b>6 FCC §15.203 AND RSS-GEN SEC 6.8- ANTENNA REQUIREMENTS .....</b>	<b>15</b>
6.1 APPLICABLE STANDARD .....	15
6.2 ANTENNA LIST AND DETAILS .....	16
<b>7 FCC §15.207 AND RSS-GEN SEC 8.8 - AC LINE CONDUCTED EMISSIONS.....</b>	<b>17</b>
7.1 APPLICABLE STANDARD .....	17
7.2 EUT SETUP AND TEST PROCEDURE.....	18
7.3 TEST EQUIPMENT LIST AND DETAILS .....	19
7.4 AC LINE CONDUCTED EMISSION TEST PLOT AND DATA .....	20
<b>8 FCC §15.209, §15.205, §15.247(D), RSS-GEN SEC 8.9, 8.10 AND RSS-247 SEC 5.5– SPURIOUS EMISSIONS .....</b>	<b>21</b>
8.1 APPLICABLE STANDARD .....	21
8.2 EUT SETUP AND TEST PROCEDURE.....	24
8.3 TEST EQUIPMENT LIST AND DETAILS .....	25
8.4 TEST RESULT .....	26
<b>9 FCC §15.247(A)(2) AND RSS-247 SEC 5.2– 6 DB EMISSION BANDWIDTH AND OCCUPIED BANDWIDTH .....</b>	<b>43</b>
9.1 APPLICABLE STANDARD .....	43
9.2 TEST PROCEDURE.....	44
9.3 TEST EQUIPMENT LIST AND DETAILS .....	45
9.4 TEST RESULTS .....	46
<b>10 FCC §15.247(B) (3) AND RSS-247 SEC 5.4(D) – MAXIMUM OUTPUT POWER .....</b>	<b>55</b>
10.1 APPLICABLE STANDARD .....	55
10.2 TEST PROCEDURE.....	55
10.3 TEST EQUIPMENT LIST AND DETAILS .....	55
10.4 TEST ENVIRONMENTAL CONDITIONS.....	55
10.5 TEST RESULTS .....	56
<b>11 FCC §15.247(D) AND RSS-247 SEC 5.5 – 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE .....</b>	<b>57</b>
11.1 APPLICABLE STANDARD .....	57
11.2 TEST PROCEDURE.....	57
11.3 TEST EQUIPMENT LIST AND DETAILS .....	58
11.4 TEST ENVIRONMENTAL CONDITIONS.....	58
11.5 TEST RESULTS .....	59

<b>12</b>	<b>FCC §15.247(E) AND RSS-247 SEC 5.2(B) – POWER SPECTRAL DENSITY .....</b>	<b>64</b>
12.1	APPLICABLE STANDARD .....	64
12.2	TEST PROCEDURE.....	64
12.3	TEST EQUIPMENT LIST AND DETAILS .....	64
12.4	TEST ENVIRONMENTAL CONDITIONS.....	64
12.5	TEST RESULTS .....	65

## 1 General Information

### 1.1 Product Description for Equipment under Test (EUT)

<b>Applicant</b>	RADICOM RESEARCH, INC. 679 EAST BROKAW ROAD, SAN JOSE, CA 95112-1005 United States
<b>Manufacturer</b>	Bluepacket communications Co., Ltd. 5F-2, NO. 12, Lane 270, Sec. 3, Beishen Rd., Shenkeng Dist., New Taipei City, Taiwan(R.O.C.)
<b>Brand Name</b>	Radicom
<b>Product (Equipment)</b>	2.4G WiFi+BT4.2(BLE) module
<b>Model Name</b>	<b>FCC:</b> RW8300E-NL <b>ISED:</b> RW8300E-NL
<b>Series Model Name</b>	<b>FCC:</b> RW8300NE-a; RW8300NE-a-NL; RW8300E-B1; RW8300E-B2; RW8300E-B3; RW8300E; RW8300E-B3-NL <b>ISED:</b> RW8300E; RW8300E-B3; RW8300E-B3-NL
<b>Model Similarity</b>	Please refer as below Model Similarity Table:
<b>Frequency Range</b>	IEEE 802.11 b/g/n HT20/HT40 mode: 2412 ~ 2462 MHz IEEE 802.11 n HT40 mode: 2422 ~ 2452 MHz
<b>Number of Channels</b>	IEEE 802.11 b/g/n HT20 mode: 11 Channels IEEE 802.11 n HT40 mode: 9 Channels
<b>Output Power</b>	IEEE 802.11b mode: 25.33 dBm (0.3412 W) IEEE 802.11g mode: 23.11 dBm (0.2046 W) IEEE 802.11n HT20 mode: 25.59 dBm (0.3622 W) IEEE 802.11n HT40 mode: 24.64 dBm (0.2911 W)
<b>Modulation Type</b>	IEEE 802.11b mode: DSSS IEEE 802.11g/n HT 20/HT40 mode: OFDM
<b>Related Submittal(s)/Grant(s)</b>	N/A
<b>Received Date</b>	Oct 15, 2019
<b>Date of Test</b>	Oct 22, 2019 ~ Oct 30, 2019

\*All measurement and test data in this report was gathered from production sample serial number: 190822001 (Assigned by BACL, Linkou Laboratory).

Model Similarity Table:

Model Name	Model Similarity
<b>RW8300E-NL</b>	Produce with enclosure, no LAN(without RJ45 jack and 10/100 base transformer) without BLE
<b>RW8300E</b>	Produce with enclosure, with LAN, WLAN without BLE
<b>RW8300E-B3-NL</b>	Produce with enclosure PCBA, with PIFA ,no LAN(without RJ45 jack and 10/100 base transformer),LAN, WLAN with BLE (BLE Contains IC: 2377A-RB8762)
<b>RW8300NE-a</b>	PCBA without enclosure, with PIFA antenna
<b>RW8300NE-a-NL</b>	PCBA without enclosure, with PIFA ,no LAN(without RJ45 jack and 10/100 base transformer)
<b>RW8300E-B1</b>	Produce with enclosure, with BT 4.0(RB1083), PIFA, (BLE Contains FCC ID: K7T-RB1000)
<b>RW8300E-B2</b>	Produce with enclosure, with BT 4.0(RB2083), PIFA, (BLE Contains FCC ID: K7T-BPM2001)
<b>RW8300E-B3</b>	Produce with enclosure, with BT 4.2(RB8762), PIFA, (BLE Contains FCC ID: K7T-RB8762)

## 1.2 Operation Condition of EUT

<b>Power Operation (Voltage Range)</b>	<input checked="" type="checkbox"/> AC 120 V/60 Hz
	<input checked="" type="checkbox"/> Adapter Brand: SWITCHING ADAPTER Model: SAPA05005US INPUT: 100-240, 50/60Hz, 0.6A Max <input type="checkbox"/> By Power Cord.
	<input checked="" type="checkbox"/> DC Type <input type="checkbox"/> DC Power Supply <input type="checkbox"/> Battery <input checked="" type="checkbox"/> External from USB Cable 5Vdc <input type="checkbox"/> External DC Adapter
	<input type="checkbox"/> Host System

### 1.3 Objective and Test Methodology

***The Objective of this Test Report was to document the compliance of the RADICOM RESEARCH, INC. Appliance (Model: FCC: RW8300E-NL; RW8300NE-a; RW8300NE-a-NL; RW8300E-B1; RW8300E-B2; RW8300E-B3; RW8300E; RW8300E-B3-NL; ISED: RW8300E-NL; RW8300E; RW8300E-B3; RW8300E-B3-NL) to the requirements of the following Standards:***

- Part 2, Subpart J, Part 15, Subparts A and C, section 15.247 of the Federal Communication Commission's rules.
- ANSI C63.10-2013 of the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
- RSS-Gen Issue 5, March 2019, Amendment 1 "General Requirements for Compliance of Radio Apparatus"
- RSS-247 Issue 2, Feb 2017 "Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices"

### 1.4 Measurement Uncertainty

Parameter	Expanded Measurement uncertainty
RF output power	± 1.488 dB
Occupied Channel Bandwidth	± 453.927 Hz
RF Conducted Emission test	± 2.77 dB
AC Power Line Conducted Emission	± 3.02 dB
Radiated Below 1G	± 3.57 dB
Radiated Above 1G	± 5.32 dB

### 1.5 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Linkou Laboratory) to collect test data is located on

No.6, Wende 2Rd., Guishan Dist., Taoyuan City 33382, Taiwan (R.O.C.).

Bay Area Compliance Laboratories Corp. (Linkou Laboratory) Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3546) by Mutual Recognition Agreement (MRA). The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database. The FCC Registration No.: 0027578244. Designation No.: TW3546. The Test Firm Registration No.: 181430. The Testing Laboratory CAB ID: TW3546, ISED Certification Number: ISED#: 25102

## 2 System Test Configuration

### 2.1 Test Channels and Description of Worst Test Configuration

The system was configured for testing in testing mode which was provided by manufacturer.

No special accessory, No modification was made to the EUT and No special equipment used during test.

For Wi-Fi 2.4G mode, there are totally 11 channels.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
<b>1</b>	<b>2412</b>	7	2442
2	2417	8	2447
<b>3</b>	<b>2422</b>	<b>9</b>	<b>2452</b>
4	2427	10	2457
5	2432	<b>11</b>	<b>2462</b>
6	<b>2437</b>	-	-

For 802.11b/g/n HT20: Channel **1**, **6** and **11** were tested. And for 802.11n HT40: Channel **3**, **6** and **9** were tested.

The major electrical and mechanical constructions of series models are identical to the basic model. For AC conduction test, the model RW8300E and RW8300E-NL are the testing sample, For RSE and Conducted test, the model RW8300E-NL is the worst by pretest with all model, and the final test data are shown on this test report.

The worst-case data rates are determined to be as follows for each mode based upon investigation by measuring the Peak power and PSD across all data rates bandwidths, and modulations. Radiated below 1G were tested worst output power mode.

Modulation Used for Conformance Test				
Configuration	NTX	Data Rate		Worst Data Rate
<b>802.11b mode</b>	1	1-11 Mbps		1 Mbps
<b>802.11g mode</b>	1	6-54 Mbps		6 Mbps
<b>802.11n HT 20 mode</b>	2	MCS 0-7		MCS 0
<b>802.11n HT 40 mode</b>	2	MCS 0-7		MCS 0

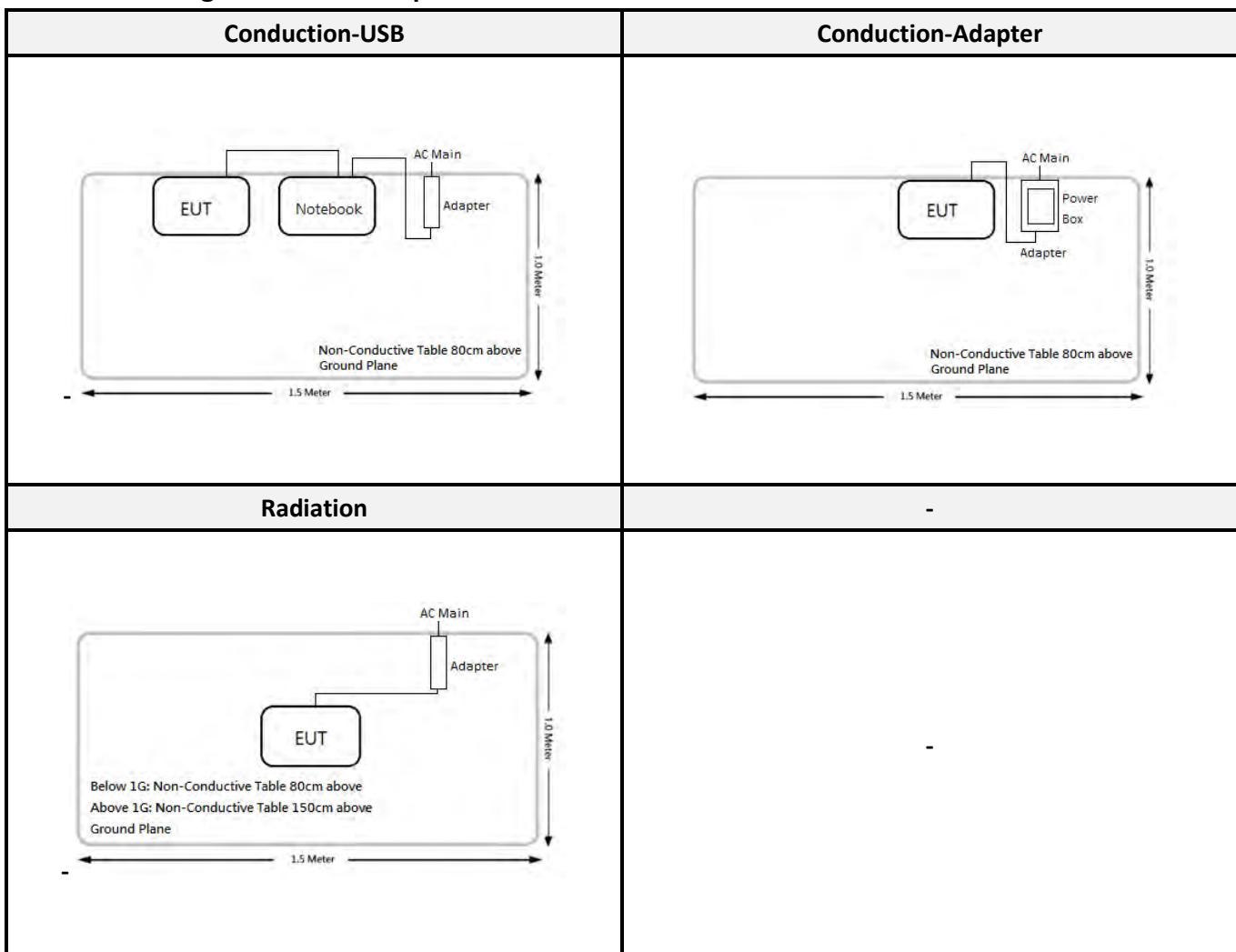
Worst Case of Power Setting						
EUT Exercise Software		Command				
Configuration	NTX	Low CH		Mid CH		High CH
		Chain0	Chain1	Chain0	Chain1	Chain0
<b>802.11b mode</b>	1	49	44	50	43	50
<b>802.11g mode</b>	1	50	47	50	50	50
<b>802.11n HT 20 mode</b>	2	44	50	47	50	47
<b>802.11n HT 40 mode</b>	2	46	50	47	50	47

## 2.2 Support Equipment List and External Cable List

No.	Description	Manufacturer	Model Number
A	Notebook PC	DELL	Latitude E5470

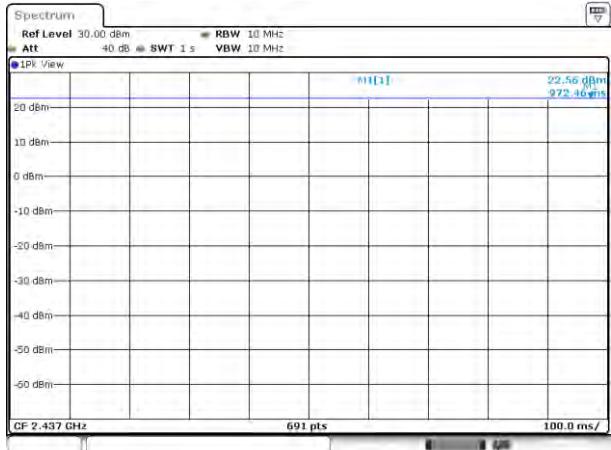
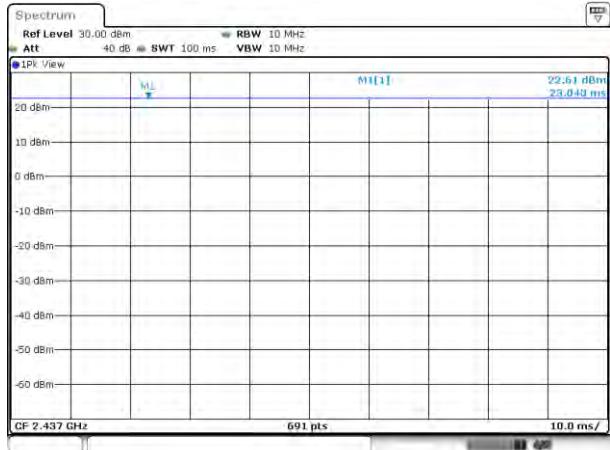
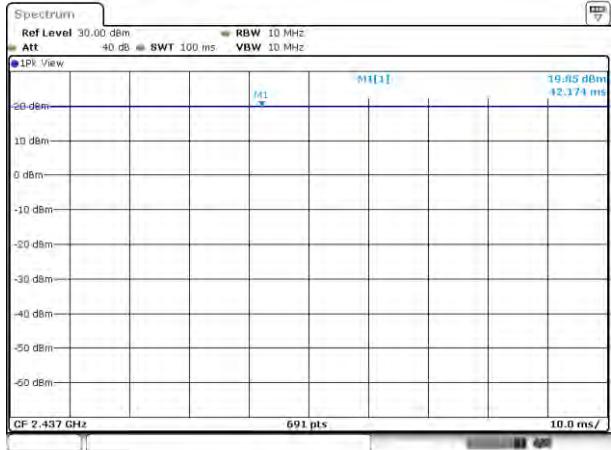
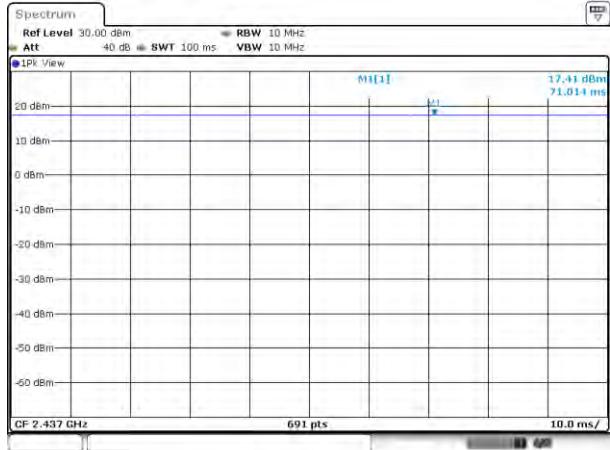
No.	Cable Description	Shielding Type	Length (m)	From	To
1	USB Cable (EUT)	Shielded	0.4	EUT	NB

## 2.3 Block Diagram of Test Setup



## 2.4 Duty Cycle

All measurements are to be performed with the EUT transmitting at 100% duty cycle at its maximum power control level; however, if 100% duty cycle cannot be achieved, measurements of duty cycle, x, and maximum power transmission duration, T, are required for each tested mode of operation.

Configuration	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Factor (dB)
<b>802.11b mode</b>	100	100	100	0
<b>802.11g mode</b>	100	100	100	0
<b>802.11n HT20 mode</b>	100	100	100	0
<b>802.11n HT40 mode</b>	100	100	100	0
<b>802.11b mode</b>		<b>802.11g mode</b>		
				
<b>802.11n HT20 mode</b>		<b>802.11n HT40 mode</b>		
				

\*Note: Duty Factor =  $10 \times \log(1/\text{Duty cycle})$

### 3 Summary of Test Results

FCC/ISED Rules	Description of Test	Result
§15.247(i), §1.1310, §2.1091	Maximum Permissible Exposure (MPE)	Compliance
ISED C RSS-102 Sec 2.5.2	Exemption Limits for Routine Evaluation – RF Exposure Evaluation	Compliance
§15.203 ISED C RSS-Gen Sec 6.8	Antenna Requirement	Compliance
§15.207(a) ISED C RSS-Gen Sec 8.8	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d) ISED C RSS-Gen Sec 8.9 and 8.10 ISED C RSS-247 Sec 5.5	Spurious Emissions	Compliance
§15.247(a)(2) ISED C RSS-247 Sec 5.2 ISED C RSS-Gen Sec 6.7	6 dB Emission Bandwidth	Compliance
§15.247(b)(3) ISED C RSS-247 Sec 5.4(d)	Maximum Peak Output Power	Compliance
§15.247(d) ISED C RSS-247 Sec 5.5	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e) ISED C RSS-247 Sec 5.2(b)	Power Spectral Density	Compliance

## 4 FCC§15.247(i), §1.1310, § 2.1091- Maximum Permissible Exposure (MPE)

### 4.1 Applicable Standard

According to 15.247(i) and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

#### Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minutes)
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

*f = frequency in MHz; \* = Plane-wave equivalent power density;*

According to §1.1310 and §2.1091 RF exposure is calculated.

**Calculated Formulary:** Prediction of MPE limit at a given distance

$S = PG/4\pi R^2$  = power density (in appropriate units, e.g. mW/cm<sup>2</sup>);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

## 4.2 RF Exposure Evaluation Result

### MPE Evaluation:

Mode	Frequency Range (MHz)	Antenna Gain		Target Power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
		(dBi)	(numeric)	(dBm)	(mW)			
Wi-Fi 2.4G	2412-2462	-0.50	0.891	26.00	398.107	20	0.0706	1

### FCC ID K7T-RB1000

Mode	Frequency Range (MHz)	Antenna Gain		Target Power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
		(dBi)	(numeric)	(dBm)	(mW)			
BLE	2402-2480	1.07	1.2794	0.50	1.1220	20	0.0003	1

### FCC ID K7T-BPM2001

Mode	Frequency Range (MHz)	Antenna Gain		Target Power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
		(dBi)	(numeric)	(dBm)	(mW)			
BLE	2402-2480	-1.00	0.7943	9.50	8.9125	20	0.0014	1

### FCC ID K7T-RB8762

Mode	Frequency Range (MHz)	Antenna Gain		Target Power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
		(dBi)	(numeric)	(dBm)	(mW)			
BLE	2402-2480	2.00	1.5849	-2.00	0.6310	20	0.0002	1

Wi-Fi and BLE can transmit simultaneously, MPE evaluation is as below formula:

PD1/Limit1+PD2/Limit2+.....<1, PD (Power Density)

**The worst case is as below:**

Max MPE of Wi-Fi + Max MPE of BLE  
 $= 0.0706/1.0 + 0.0014/1 = 0.0720 < 1.0$

**Result:** MPE evaluation of single and simultaneous transmission meet 20 cm the requirement of standard

## 5 RSS-102 Sec 2.5.2- Exemption Limits for Routine Evaluation – RF Exposure Evaluation

### 5.1 Applicable Standard

According to RSS-102 Sec 2.5.2,

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz<sup>6</sup> and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $4.49/f^{0.5}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $1.31 \times 10^{-2} f^{0.6834}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

### 5.2 RF Exposure Evaluation Result

For Wi-Fi

Max tune-up conducted output power 26 dBm (398.1072 mW) at 2462 MHz, Antenna Gain: -0.5 dBi, EIRP = 25.5 dBm (0.3548 W). So the maximum conducted and E.I.R.P. source-based, time-averaged output is less than 2.72 W for general public use.

**Result:** MPE test exempted.

*\*Note: Limit Result =  $1.31 \times 10^{-2} \times (2462)^{0.6834} = 2.72$  W*

## 6 FCC §15.203 and RSS-Gen Sec 6.8- Antenna Requirements

---

### 6.1 Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna does not exceed 6dBi

According to RSS-Gen 6.8: Transmitter Antenna for Licence-Exempt Radio Apparatus

The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level.<sup>Footnote8</sup> When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

## 6.2 Antenna List and Details

Brand	Model	Antenna Type	Antenna Gain	Result
Radicom	Wi-Fi Ant	PIFA	-0.50	Compliance

*The EUT have two the same internal antenna arrangement, which were permanently attached, fulfill the requirement of this section.*

## 7 FCC §15.207 and RSS-Gen Sec 8.8 - AC Line Conducted Emissions

### 7.1 Applicable Standard

According to FCC §15.207

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

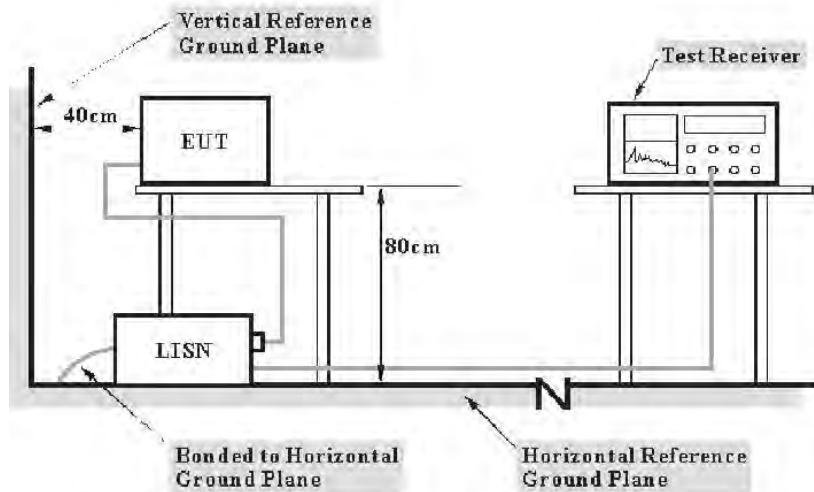
According to RSS-Gen 8.8 Conducted limits:

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Channel	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 <small>Note 1</small>	56 to 46 <small>Note 2</small>
0.5-5	56	46
5-30	60	50

Note 1: Decreases with the logarithm of the frequency. Note 2: A linear average detector is required

## 7.2 EUT Setup and Test Procedure



**Note:** 1. Support units were connected to second LISN.  
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 and RSS-Gen sec 8.8 limits.

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz. During the conducted emission test, the EMI test receiver was set with the following configurations

Frequency Range	Receiver RBW
150 kHz - 30 MHz	9 kHz

During the conducted emission test, the adapter was connected to the outlet of the LISN. Maximizing procedure was performed on the six (6) highest emissions of the EUT. All data was recorded in the Quasi-peak and average detection mode.

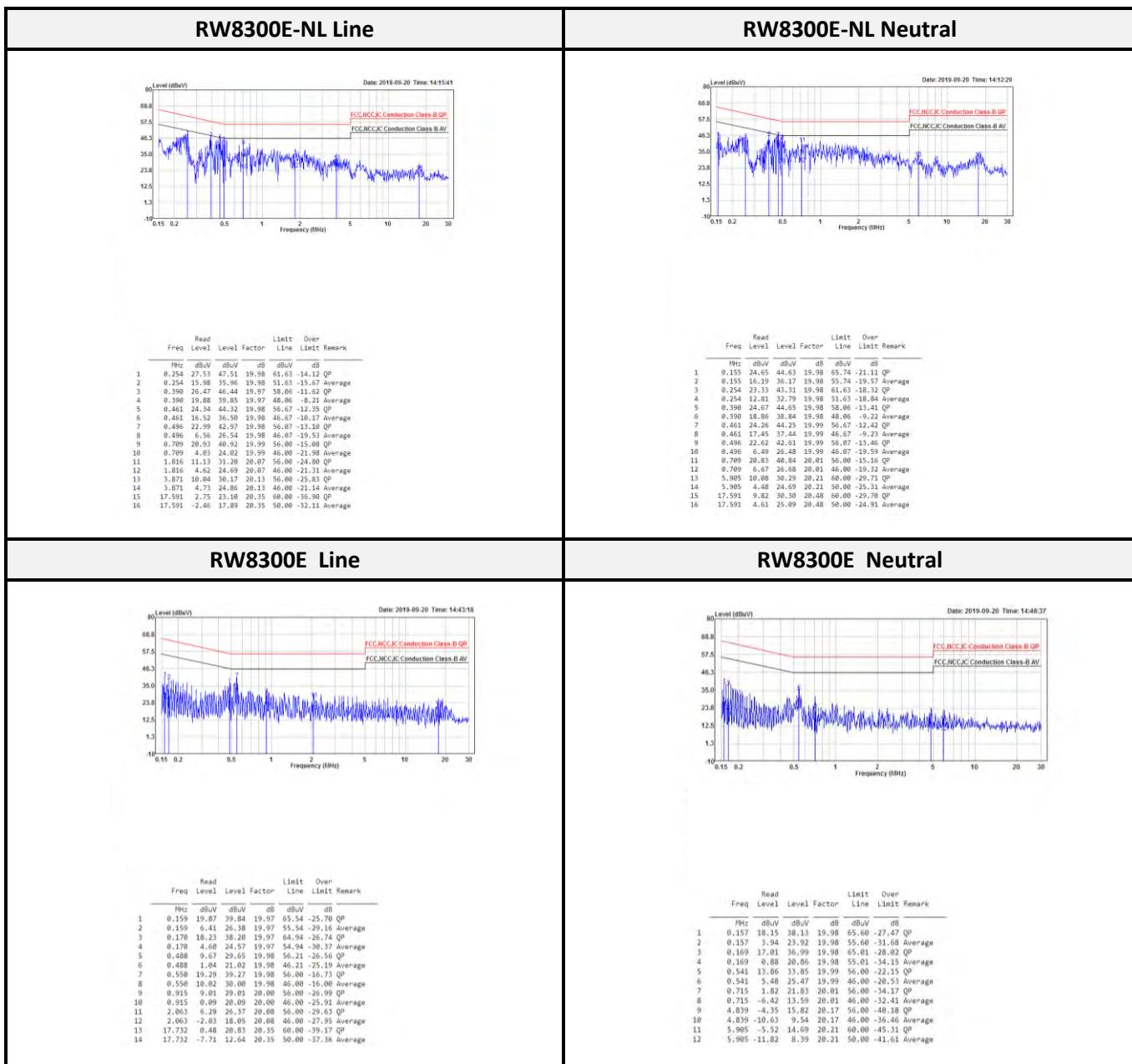
### 7.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
<b>Conduction Room</b>					
Two-Line V-Network	Rohde & Schwarz	ENV216	100010	2019/09/02	2020/09/01
Pulse Limiter	SCHWARZBECK	VSTD 9561-F	00432	2019/08/28	2020/08/27
ESR EMI Test Receiver	Rohde & Schwarz	ESR3	102430	2019/03/27	2020/03/26
RF Cable	EMCI	EMCCFD300-BM-BM-8000	180526	2019/08/08	2020/08/07
Software	Audix	e3 v9	E3LK-03	N.C.R	N.C.R

**\*Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

## 7.4 AC Line Conducted Emission Test Plot and Data

Temperature:	24°C	Relative Humidity:	51 %
Test Date:	2019-09-20	Test Engineer:	Ray Huang
Test Voltage	120V/60Hz	Mode	Wi-Fi mode



Note:

Level = Read Level + Factor

Over Limit (Margin) = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

## 8 FCC §15.209, §15.205, §15.247(d), RSS-Gen Sec 8.9, 8.10 and RSS-247 Sec 5.5– Spurious Emissions

### 8.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1MHz.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	13.36-13.41	399.9-410	4.5-5.15
0.495-0.505	16.42-16.423	608-614	5.35-5.46
2.1735-2.1905	16.69475-16.69525	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c).

As per RSS-Gen 8.9,

Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table 4 and Table 5 below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

**Table 4 – General Field Strength Limits for Licence-Exempt Transmitters at Frequencies Above 30 MHz**

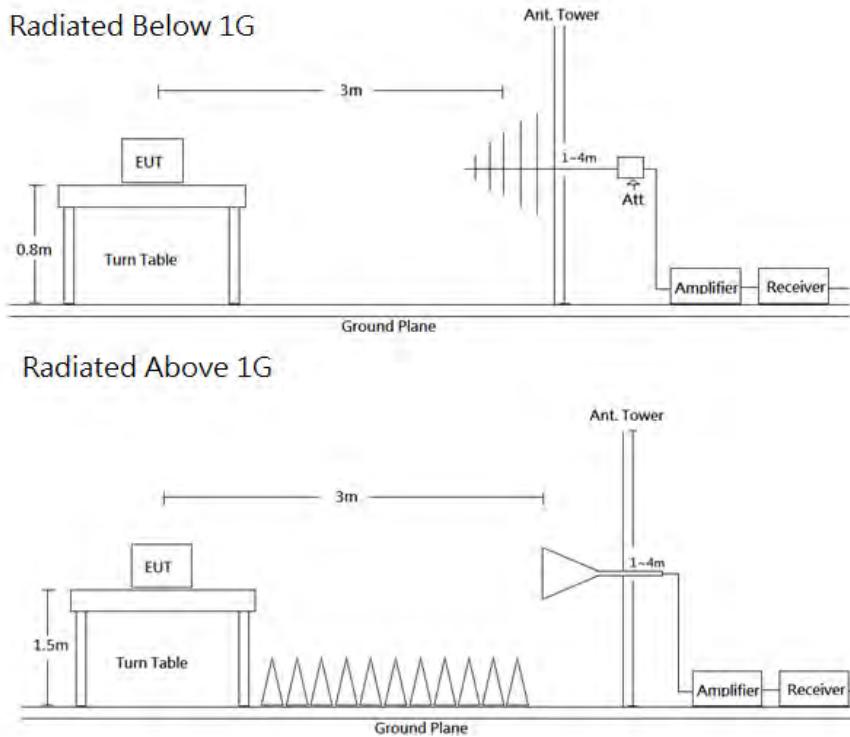
Frequency (MHz)	Field Strength (uV/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960*	500

\* Unless otherwise specified, for all frequencies greater than 1 GHz, the radiated emission limits for licence-exempt radio apparatus stated in applicable RSSs (including RSS-Gen) are based on measurements using a linear average detector function having a minimum resolution bandwidth of 1 MHz. If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for such factors as pulse desensitization to ensure the peak emission is less than 20 dB above the average limit.

Note: Transmitting devices are not permitted in restricted frequency bands unless stated otherwise in the specific RSS.

As per RSS-247 §5.5, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

## 8.2 EUT Setup and Test Procedure



Radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the RSS-247, RSS-Gen, FCC Part 15.209 and FCC 15.247 Limits.

The system was investigated from 30 MHz to 26.5 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10.

Frequency Range	RBW	VBW	Detector	Duty cycle	Measurement method
30-1000 MHz	120 kHz	/	QP	-	QP
Above 1 GHz	1 MHz	3 MHz	PK	-	PK
	1 MHz	10 Hz	RMS	>98%	Ave
	1 MHz	1/T	PK	<98%	Ave

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations. All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

### 8.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
<b>Radiation 3M Room (966A)</b>					
Active Loop	EMCO	6502	0001-3322	2019/03/15	2020/03/14
Bilog Antenna/6 dB Attenuator	SUNOL SCIENCES & EMEC /EMCI	JB3/N-6-06	A111513/AT-N0668	2019/03/29	2020/03/28
Signal and Spectrum Analyzer	Rohde & Schwarz	FSV40	101434	2019/04/17	2020/04/16
Horn Antenna	ETS-Lindgren	3115	00109141	2019/07/05	2020/07/04
Horn Antenna	ETS-Lindgren	3160-09	00123852	2019/07/11	2020/07/10
Preamplifier	A.H. Systems	PAM-1840VH	174	2019/02/18	2020/02/17
Preamplifier	A.H. Systems	PAM-0118	478	2019/03/28	2020/03/27
Microflex Cable (1m)	EMCI	EMC106-SM-SM-2000	180515	2019/08/07	2020/08/06
Microflex Cable (2m)	MTJ	H0919	00000-MT28A-100	2019/08/07	2020/08/06
Microflex Cable (8m)	UTIFLEX	UFA210A-1-3149-300300	MFR 64639 232490-001	2019/08/07	2020/08/06
Turn Table	Chaintek	T-200-S-1	003501	N.C.R	N.C.R
Antenna Tower	Chaintek	MBD-400-1	003504	N.C.R	N.C.R
Controller	Chaintek	3000-1	003507	N.C.R	N.C.R
Software	Audix	e3 v9	E3LK-01	N.C.R	N.C.R
<b>Conducted Room(TH-01)</b>					
Signal Analyzer 40GHZ	Rohde & Schwarz	FSV40-N	102248	2019/09/11	2020/09/10
Cable	MTJ	MT40S	620620-MT40S-100	2018/12/28	2019/12/27

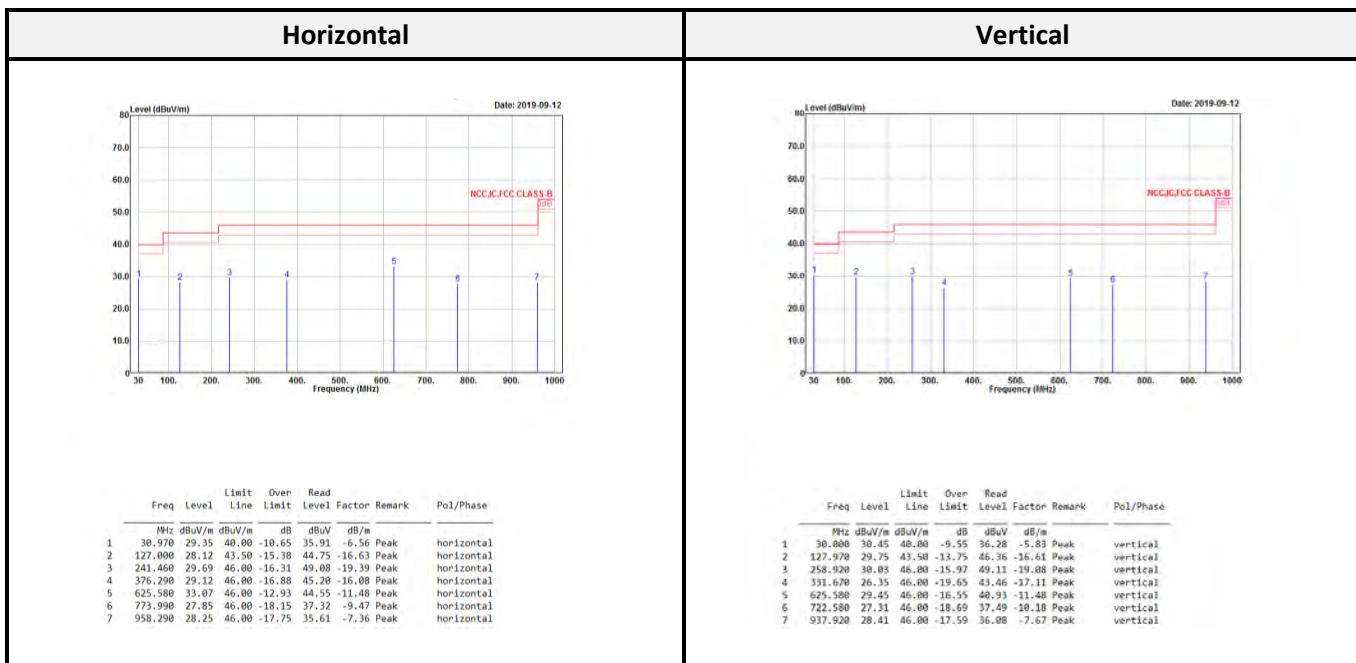
**\*Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

## 8.4 Test Result

Temperature:	20.4-23.7°C	Relative Humidity:	48-48% RH
Test Date:	2019-09-11 to 2019-09-12	Test Engineer:	Leo Cheng
Test Voltage	120V/60Hz	Mode	Wi-Fi Tx mode

**Transmitting mode** (Pre-scan with three orthogonal axis, and worse case as Z axis)

**Below 1G (30 MHz-1 GHz) test the worst mode**



*Result = Reading + Correct Factor*

*Margin = Result – Limit*

*Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain*

*Spurious emissions more than 20 dB below the limit were not reported*

**Above 1G (1 GHz-26.5 GHz)****802.11b mode Chain 0:**

Low CH													
Horizontal					Vertical								
Freq	Level	Limit	Over	Read	Freq	Level	Limit	Over	Read				
MHz	dBuV/m	dBuV/m	dB	dBuV	MHz	dBuV/m	dBuV/m	dB	dBuV				
2336.992	37.56	54.00	-16.44	45.35	-7.79	Average	2375.856	38.87	54.00	-15.13	46.53	-7.66	Average
2336.992	51.73	74.00	-22.27	59.52	-7.79	Peak	2375.856	51.51	74.00	-22.49	59.17	-7.66	Peak
2411.920	83.13			90.73	-7.60	Average	2411.248	87.94			95.54	-7.60	Average
2411.920	85.80			93.40	-7.60	Peak	2411.248	90.34			97.94	-7.60	Peak
4824.000	48.54	54.00	-5.46	47.90	0.64	Average	4824.000	52.42	54.00	-1.58	51.78	0.64	Average
4824.000	51.79	74.00	-22.21	51.15	0.64	Peak	4824.000	55.28	74.00	-18.72	54.64	0.64	Peak
7236.000	44.98	54.00	-9.02	39.59	5.39	Average	7236.000	47.03	54.00	-6.97	41.65	5.38	Average
7236.000	52.99	74.00	-21.01	47.60	5.39	Peak	7236.000	54.91	74.00	-19.09	49.53	5.38	Peak
9648.000	51.78	54.00	-2.22	43.06	8.72	Average	9648.000	49.65	54.00	-4.35	40.94	8.71	Average
9648.000	56.20	74.00	-17.80	47.48	8.72	Peak	9648.000	55.55	74.00	-18.45	46.84	8.71	Peak

Middle CH													
Horizontal					Vertical								
Freq	Level	Limit	Over	Read	Freq	Level	Limit	Over	Read				
MHz	dBuV/m	dBuV/m	dB	dBuV	MHz	dBuV/m	dBuV/m	dB	dBuV				
2337.830	37.20	54.00	-16.80	44.98	-7.78	Average	2340.008	37.56	54.00	-16.44	45.33	-7.77	Average
2337.830	51.49	74.00	-22.51	59.27	-7.78	Peak	2340.008	50.34	74.00	-23.66	58.11	-7.77	Peak
2436.324	85.23			92.77	-7.54	Average	2436.324	88.05			95.59	-7.54	Average
2436.324	87.84			95.38	-7.54	Peak	2436.324	90.45			97.99	-7.54	Peak
2485.934	37.86	54.00	-16.14	45.20	-7.34	Average	2494.888	38.19	54.00	-15.81	45.52	-7.33	Average
2485.934	51.68	74.00	-22.32	59.02	-7.34	Peak	2494.888	53.39	74.00	-20.61	60.72	-7.33	Peak
4874.000	48.00	54.00	-6.00	47.20	0.80	Average	4874.000	51.75	54.00	-2.25	50.95	0.80	Average
4874.000	51.07	74.00	-22.93	50.27	0.80	Peak	4874.000	54.24	74.00	-19.76	53.44	0.80	Peak
7311.000	49.36	54.00	-4.64	43.74	5.62	Average	7311.000	46.07	54.00	-7.93	40.45	5.62	Average
7311.000	55.45	74.00	-18.55	49.83	5.62	Peak	7311.000	53.27	74.00	-20.73	47.65	5.62	Peak
9748.000	47.73	54.00	-6.27	38.79	8.94	Average	9748.000	48.76	54.00	-5.24	39.82	8.94	Average
9748.000	54.54	74.00	-19.46	45.60	8.94	Peak	9748.000	54.77	74.00	-19.23	45.83	8.94	Peak

High CH													
Horizontal					Vertical								
Freq	Level	Limit	Over	Read	Freq	Level	Limit	Over	Read				
MHz	dBuV/m	dBuV/m	dB	dBuV	MHz	dBuV/m	dBuV/m	dB	dBuV				
2462.900	85.58			93.00	-7.42	Average	2462.900	88.23			95.65	-7.42	Average
2462.900	88.22			95.64	-7.42	Peak	2462.900	90.74			98.16	-7.42	Peak
2489.200	44.98	54.00	-9.02	52.31	-7.33	Average	2488.700	47.86	54.00	-6.14	55.19	-7.33	Average
2489.200	54.12	74.00	-19.88	61.45	-7.33	Peak	2488.700	55.74	74.00	-18.26	63.07	-7.33	Peak
4924.000	45.60	54.00	-8.40	44.77	0.83	Average	4924.000	50.45	54.00	-3.55	49.62	0.83	Average
4924.000	50.54	74.00	-23.46	49.71	0.83	Peak	4924.000	53.82	74.00	-20.18	52.99	0.83	Peak
7386.000	52.12	54.00	-1.88	46.19	5.93	Average	7386.000	49.52	54.00	-4.48	43.59	5.93	Average
7386.000	57.79	74.00	-16.21	51.86	5.93	Peak	7386.000	55.57	74.00	-18.43	49.64	5.93	Peak
9848.000	47.16	54.00	-6.84	38.40	8.76	Average	9848.000	50.36	54.00	-3.64	41.60	8.76	Average
9848.000	53.18	74.00	-20.82	44.42	8.76	Peak	9848.000	55.81	74.00	-18.19	47.05	8.76	Peak

## 802.11b mode Chain 1:

Low CH													
Horizontal					Vertical								
Freq	Level	Limit	Over	Read	Freq	Level	Limit	Over	Read				
MHz	dBuV/m	dBuV/m	dB	dBuV	MHz	dBuV/m	dBuV/m	dB	dBuV				
2383.584	50.31	54.00	-3.69	57.95	-7.64	Average	2376.080	45.88	54.00	-8.12	53.54	-7.66	Average
2383.584	57.85	74.00	-16.15	65.49	-7.64	Peak	2376.080	54.85	74.00	-19.15	62.51	-7.66	Peak
2413.040	94.51			102.10	-7.59	Average	2411.248	90.20			97.80	-7.60	Average
2413.040	96.99			104.58	-7.59	Peak	2411.248	92.13			99.73	-7.60	Peak
4824.000	43.20	54.00	-10.80	42.56	0.64	Average	4824.000	52.79	54.00	-1.21	52.15	0.64	Average
4824.000	49.47	74.00	-24.53	48.83	0.64	Peak	4824.000	54.98	74.00	-19.02	54.34	0.64	Peak
7236.000	47.02	54.00	-6.98	41.63	5.39	Average	7236.000	49.90	54.00	-4.10	44.51	5.39	Average
7236.000	54.23	74.00	-19.77	48.84	5.39	Peak	7236.000	55.97	74.00	-18.03	50.58	5.39	Peak
9648.000	43.22	54.00	-10.78	34.50	8.72	Average	9648.000	41.31	54.00	-12.69	32.52	8.79	Average
9648.000	53.00	74.00	-21.00	44.28	8.72	Peak	9648.000	51.66	74.00	-22.34	42.87	8.79	Peak

Middle CH													
Horizontal					Vertical								
Freq	Level	Limit	Over	Read	Freq	Level	Limit	Over	Read				
MHz	dBuV/m	dBuV/m	dB	dBuV	MHz	dBuV/m	dBuV/m	dB	dBuV				
2389.376	43.09	54.00	-10.91	50.72	-7.63	Average	2389.618	40.31	54.00	-13.69	47.94	-7.63	Average
2389.376	53.74	74.00	-20.26	61.37	-7.63	Peak	2389.618	52.15	74.00	-21.85	59.78	-7.63	Peak
2436.324	93.29			100.83	-7.54	Average	2436.324	87.57			95.11	-7.54	Average
2436.324	95.99			103.53	-7.54	Peak	2436.324	90.19			97.73	-7.54	Peak
2487.628	41.37	54.00	-12.63	48.70	-7.33	Average	2534.576	38.71	54.00	-15.29	45.91	-7.20	Average
2487.628	53.92	74.00	-20.08	61.25	-7.33	Peak	2534.576	51.75	74.00	-22.25	58.95	-7.20	Peak
4874.000	46.02	54.00	-7.98	45.22	0.80	Average	4874.000	52.67	54.00	-1.33	51.87	0.80	Average
4874.000	50.59	74.00	-23.41	49.79	0.80	Peak	4874.000	55.19	74.00	-18.81	54.39	0.80	Peak
7311.000	47.20	54.00	-6.80	41.58	5.62	Average	7311.000	48.46	54.00	-5.54	42.84	5.62	Average
7311.000	54.08	74.00	-19.92	48.46	5.62	Peak	7311.000	55.10	74.00	-18.90	49.48	5.62	Peak

High CH													
Horizontal					Vertical								
Freq	Level	Limit	Over	Read	Freq	Level	Limit	Over	Read				
MHz	dBuV/m	dBuV/m	dB	dBuV	MHz	dBuV/m	dBuV/m	dB	dBuV				
2461.100	91.00			98.43	-7.43	Average	2461.100	86.29			93.72	-7.43	Average
2461.100	93.63			101.06	-7.43	Peak	2461.100	88.88			96.31	-7.43	Peak
2487.400	51.17	54.00	-2.83	58.51	-7.34	Average	2487.400	44.91	54.00	-9.09	52.25	-7.34	Average
2487.400	57.66	74.00	-16.34	65.00	-7.34	Peak	2487.400	54.73	74.00	-19.27	62.07	-7.34	Peak
4924.000	46.44	54.00	-7.56	45.61	0.83	Average	4924.000	53.05	54.00	-0.95	52.22	0.83	Average
4924.000	50.69	74.00	-23.31	49.86	0.83	Peak	4924.000	55.74	74.00	-18.26	54.91	0.83	Peak
7386.000	48.58	54.00	-5.42	42.65	5.93	Average	7386.000	42.55	54.00	-11.45	36.67	5.88	Average
7386.000	54.69	74.00	-19.31	48.76	5.93	Peak	7386.000	52.46	74.00	-21.54	46.58	5.88	Peak

## 802.11g mode Chain0:

Low CH															
Horizontal						Vertical									
Freq	Level	Limit	Over Line	Read Limit	Read Level	Factor	Remark	Freq	Level	Limit	Over Line	Read Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m			MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
2389.968	39.93	54.00	-14.07	47.56	-7.63	Average		2389.632	40.23	54.00	-13.77	47.86	-7.63	Average	
2389.968	53.75	74.00	-20.25	61.38	-7.63	Peak		2389.632	54.58	74.00	-19.42	62.21	-7.63	Peak	
2418.864	77.39			84.97	-7.58	Average		2405.648	79.49			87.10	-7.61	Average	
2418.864	86.93			94.51	-7.58	Peak		2405.648	89.16			96.77	-7.61	Peak	
4824.000	32.48	54.00	-21.52	31.84	0.64	Average		4824.000	34.48	54.00	-19.52	33.84	0.64	Average	
4824.000	47.53	74.00	-26.47	46.89	0.64	Peak		4824.000	48.45	74.00	-25.55	47.81	0.64	Peak	
7236.000	37.79	54.00	-16.21	32.41	5.38	Average		7236.000	35.75	54.00	-18.25	30.37	5.38	Average	
7236.000	51.11	74.00	-22.89	45.73	5.38	Peak		7236.000	49.47	74.00	-24.53	44.09	5.38	Peak	

Middle CH															
Horizontal						Vertical									
Freq	Level	Limit	Over Line	Read Limit	Read Level	Factor	Remark	Freq	Level	Limit	Over Line	Read Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m			MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
2340.734	37.57	54.00	-16.43	45.34	-7.77	Average		2385.746	37.86	54.00	-16.14	45.50	-7.64	Average	
2340.734	51.59	74.00	-22.41	59.36	-7.77	Peak		2385.746	51.09	74.00	-22.91	58.73	-7.64	Peak	
2443.826	77.04			84.54	-7.50	Average		2443.826	80.90			88.40	-7.50	Average	
2443.826	86.55			94.05	-7.50	Peak		2443.826	90.14			97.64	-7.50	Peak	
2516.184	39.06	54.00	-14.94	46.33	-7.27	Average		2483.514	38.93	54.00	-15.07	46.27	-7.34	Average	
2516.184	52.04	74.00	-21.96	59.31	-7.27	Peak		2483.514	52.77	74.00	-21.23	60.11	-7.34	Peak	
4874.000	33.29	54.00	-20.71	32.50	0.79	Average		4874.000	35.31	54.00	-18.69	34.51	0.80	Average	
4874.000	46.70	74.00	-27.30	45.91	0.79	Peak		4874.000	49.30	74.00	-24.70	48.50	0.80	Peak	
7311.000	37.54	54.00	-16.46	31.92	5.62	Average		7311.000	37.24	54.00	-16.76	31.60	5.64	Average	
7311.000	52.49	74.00	-21.51	46.87	5.62	Peak		7311.000	51.50	74.00	-22.50	45.86	5.64	Peak	

High CH															
Horizontal						Vertical									
Freq	Level	Limit	Over Line	Read Limit	Read Level	Factor	Remark	Freq	Level	Limit	Over Line	Read Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m			MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
2468.300	76.57			83.97	-7.40	Average		2468.400	80.35			87.75	-7.40	Average	
2468.300	86.67			94.07	-7.40	Peak		2468.400	89.85			97.25	-7.40	Peak	
2483.900	44.51	54.00	-9.49	51.85	-7.34	Average		2484.200	47.34	54.00	-6.66	54.68	-7.34	Average	
2483.900	59.82	74.00	-14.18	67.16	-7.34	Peak		2484.200	62.21	74.00	-11.79	69.55	-7.34	Peak	
4924.000	32.65	54.00	-21.35	31.81	0.84	Average		4924.000	34.38	54.00	-19.62	33.55	0.83	Average	
4924.000	46.54	74.00	-27.46	45.70	0.84	Peak		4924.000	47.72	74.00	-26.28	46.89	0.83	Peak	
7386.000	41.81	54.00	-12.19	35.88	5.93	Average		7386.000	38.52	54.00	-15.48	32.60	5.92	Average	
7386.000	56.64	74.00	-17.36	50.71	5.93	Peak		7386.000	52.63	74.00	-21.37	46.71	5.92	Peak	

## 802.11g mode Chain1:

Low CH												
Horizontal						Vertical						
Freq	Level	Limit	Over	Read		Freq	Level	Limit	Over	Read		
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2389.968	52.37	54.00	-1.63	60.00	-7.63	Average	2389.968	48.01	54.00	-5.99	55.64	-7.63
2389.968	70.17	74.00	-3.83	77.80	-7.63	Peak	2389.968	65.60	74.00	-8.40	73.23	-7.63
2405.760	87.84			95.45	-7.61	Average	2405.648	83.04			90.65	-7.61
2405.760	97.70			105.31	-7.61	Peak	2405.648	92.75			100.36	-7.61
4824.000	32.17	54.00	-21.83	31.53	0.64	Average	4824.000	34.93	54.00	-19.07	34.29	0.64
4824.000	45.93	74.00	-28.07	45.29	0.64	Peak	4824.000	49.15	74.00	-24.85	48.51	0.64
7236.000	36.98	54.00	-17.02	31.60	5.38	Average	7236.000	37.14	54.00	-16.86	31.76	5.38
7236.000	51.37	74.00	-22.63	45.99	5.38	Peak	7236.000	51.18	74.00	-22.82	45.80	5.38

Middle CH												
Horizontal						Vertical						
Freq	Level	Limit	Over	Read		Freq	Level	Limit	Over	Read		
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2386.956	45.02	54.00	-8.98	52.66	-7.64	Average	2387.198	40.96	54.00	-13.04	48.60	-7.64
2386.956	58.13	74.00	-15.87	65.77	-7.64	Peak	2387.198	54.45	74.00	-19.55	62.09	-7.64
2430.758	87.87			95.43	-7.56	Average	2430.758	82.42			89.98	-7.56
2430.758	97.30			104.86	-7.56	Peak	2430.758	92.04			99.60	-7.56
2483.756	42.00	54.00	-12.00	49.34	-7.34	Average	2532.398	39.09	54.00	-14.91	46.31	-7.22
2483.756	54.67	74.00	-19.33	62.01	-7.34	Peak	2532.398	52.76	74.00	-21.24	59.98	-7.22
4874.000	33.33	54.00	-20.67	32.53	0.80	Average	4874.000	38.69	54.00	-15.31	37.89	0.80
4874.000	46.60	74.00	-27.40	45.80	0.80	Peak	4874.000	49.51	74.00	-24.49	48.71	0.80
7311.000	35.62	54.00	-18.38	29.98	5.64	Average	7311.000	39.24	54.00	-14.76	33.62	5.62
7311.000	49.03	74.00	-24.97	43.39	5.64	Peak	7311.000	51.44	74.00	-22.56	45.82	5.62

High CH												
Horizontal						Vertical						
Freq	Level	Limit	Over	Read		Freq	Level	Limit	Over	Read		
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2468.400	84.25			91.65	-7.40	Average	2455.600	80.00			87.45	-7.45
2468.400	94.20			101.60	-7.40	Peak	2455.600	88.92			96.37	-7.45
2483.500	52.76	54.00	-1.24	60.10	-7.34	Average	2483.600	46.31	54.00	-7.69	53.65	-7.34
2483.500	68.38	74.00	-5.62	75.72	-7.34	Peak	2483.600	62.15	74.00	-11.85	69.49	-7.34
4924.000	32.79	54.00	-21.21	31.96	0.83	Average	4924.000	38.44	54.00	-15.56	37.60	0.84
4924.000	47.34	74.00	-26.66	46.51	0.83	Peak	4924.000	52.48	74.00	-21.52	51.64	0.84
7386.000	38.57	54.00	-15.43	32.65	5.92	Average	7386.000	38.62	54.00	-15.38	32.70	5.92
7386.000	51.74	74.00	-22.26	45.82	5.92	Peak	7386.000	52.62	74.00	-21.38	46.70	5.92

## 802.11n HT20 mode:

Low CH													
Horizontal						Vertical							
Freq	Level	Limit	Over	Read		Freq	Level	Limit	Over	Read			
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
2389.968	51.31	54.00	-2.69	58.94	-7.63	Average	2389.968	46.13	54.00	-7.87	53.76	-7.63	Average
2389.968	70.76	74.00	-3.24	78.39	-7.63	Peak	2389.968	63.34	74.00	-10.66	70.97	-7.63	Peak
2404.080	87.33			94.94	-7.61	Average	2409.120	82.16			89.76	-7.60	Average
2404.080	96.68			104.29	-7.61	Peak	2409.120	91.93			99.53	-7.60	Peak
4824.000	36.46	54.00	-17.54	35.84	0.62	Average	4824.000	34.23	54.00	-19.77	33.59	0.64	Average
4824.000	52.05	74.00	-21.95	51.43	0.62	Peak	4824.000	49.30	74.00	-24.70	48.66	0.64	Peak
7236.000	36.95	54.00	-17.05	31.57	5.38	Average	7236.000	37.77	54.00	-16.23	32.38	5.39	Average
7236.000	52.28	74.00	-21.72	46.90	5.38	Peak	7236.000	52.91	74.00	-21.09	47.52	5.39	Peak

Middle CH													
Horizontal						Vertical							
Freq	Level	Limit	Over	Read		Freq	Level	Limit	Over	Read			
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
2388.892	39.92	54.00	-14.08	47.55	-7.63	Average	2387.198	38.98	54.00	-15.02	46.62	-7.64	Average
2388.892	53.19	74.00	-20.81	60.82	-7.63	Peak	2387.198	51.74	74.00	-22.26	59.38	-7.64	Peak
2429.306	86.95			94.51	-7.56	Average	2434.146	82.06			89.60	-7.54	Average
2429.306	96.07			103.63	-7.56	Peak	2434.146	91.50			99.04	-7.54	Peak
2492.468	39.01	54.00	-14.99	46.34	-7.33	Average	2504.326	38.47	54.00	-15.53	45.77	-7.30	Average
2492.468	52.43	74.00	-21.57	59.76	-7.33	Peak	2504.326	52.36	74.00	-21.64	59.66	-7.30	Peak
4874.000	34.39	54.00	-19.61	33.59	0.80	Average	4874.000	38.31	54.00	-15.69	37.58	0.73	Average
4874.000	48.70	74.00	-25.30	47.90	0.80	Peak	4874.000	53.45	74.00	-20.55	52.72	0.73	Peak
7311.000	39.43	54.00	-14.57	33.71	5.72	Average	7311.000	37.18	54.00	-16.82	31.54	5.64	Average
7311.000	54.45	74.00	-19.55	48.73	5.72	Peak	7311.000	52.05	74.00	-21.95	46.41	5.64	Peak

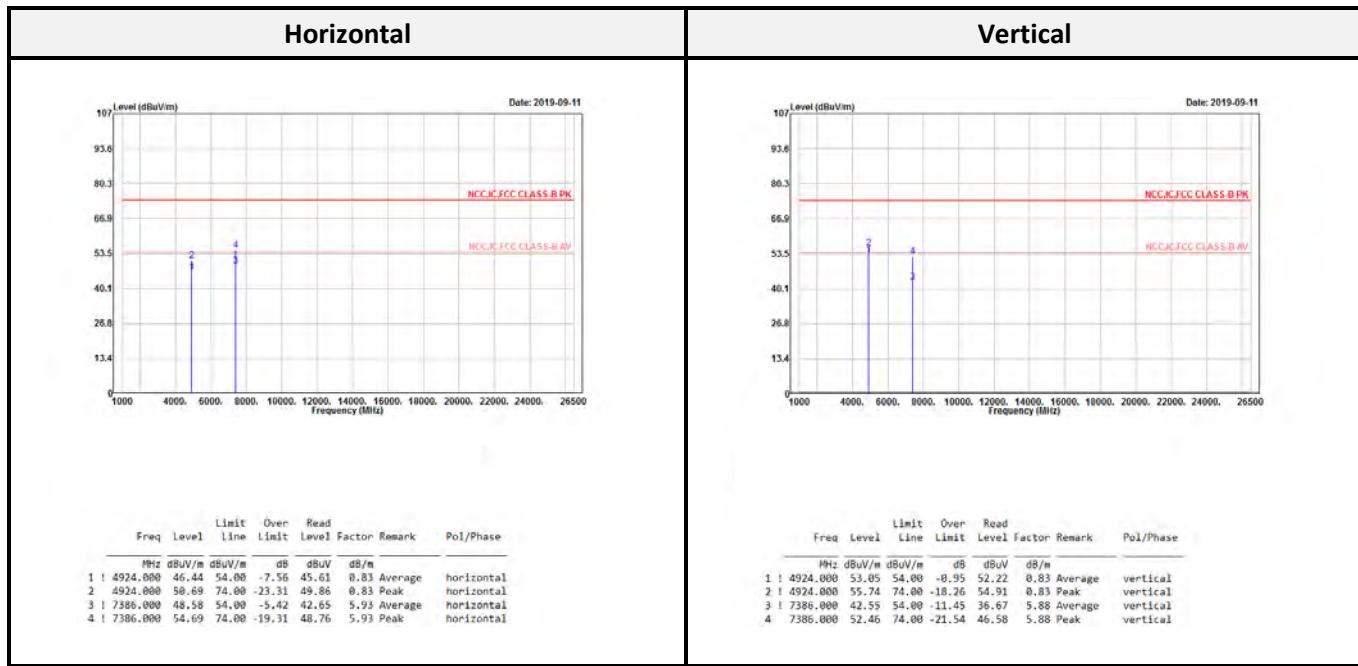
High CH													
Horizontal						Vertical							
Freq	Level	Limit	Over	Read		Freq	Level	Limit	Over	Read			
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
2454.100	82.35			89.81	-7.46	Average	2469.400	82.25			89.64	-7.39	Average
2454.100	92.13			99.59	-7.46	Peak	2469.400	91.63			99.02	-7.39	Peak
2483.600	51.30	54.00	-2.70	58.64	-7.34	Average	2483.700	44.97	54.00	-9.03	52.31	-7.34	Average
2483.600	67.53	74.00	-6.47	74.87	-7.34	Peak	2483.700	60.52	74.00	-13.48	67.86	-7.34	Peak
4924.000	33.82	54.00	-20.18	32.98	0.84	Average	4924.000	38.34	54.00	-15.66	37.51	0.83	Average
4924.000	48.69	74.00	-25.31	47.85	0.84	Peak	4924.000	53.36	74.00	-20.64	52.53	0.83	Peak
7386.000	42.64	54.00	-11.36	36.71	5.93	Average	7386.000	38.87	54.00	-15.13	32.95	5.92	Average
7386.000	57.52	74.00	-16.48	51.59	5.93	Peak	7386.000	52.90	74.00	-21.10	46.98	5.92	Peak

## 802.11n HT40 mode:

Low CH												
Horizontal						Vertical						
Freq	Level	Limit	Over	Read		Freq	Level	Limit	Over	Read		
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2388.936	50.89	54.00	-3.11	58.52	-7.63	Average	2388.672	44.71	54.00	-9.29	52.34	-7.63
2388.936	66.65	74.00	-7.35	74.28	-7.63	Peak	2388.672	60.87	74.00	-13.13	68.50	-7.63
2419.956	82.83			90.41	-7.58	Average	2419.956	78.03			85.61	-7.58
2419.956	92.78			100.36	-7.58	Peak	2419.956	87.78			95.36	-7.58
4844.000	31.42	54.00	-22.58	30.74	0.68	Average	4844.000	36.00	54.00	-18.00	35.36	0.64
4844.000	46.08	74.00	-27.92	45.40	0.68	Peak	4844.000	49.31	74.00	-24.69	48.67	0.64
7266.000	34.19	54.00	-19.81	28.76	5.43	Average	7266.000	34.14	54.00	-19.86	28.71	5.43
7266.000	47.65	74.00	-26.35	42.22	5.43	Peak	7266.000	48.00	74.00	-26.00	42.57	5.43

Middle CH												
Horizontal						Vertical						
Freq	Level	Limit	Over	Read		Freq	Level	Limit	Over	Read		
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2389.376	42.99	54.00	-11.01	50.62	-7.63	Average	2389.618	40.02	54.00	-13.98	47.65	-7.63
2389.376	57.82	74.00	-16.18	65.45	-7.63	Peak	2389.618	54.20	74.00	-19.80	61.83	-7.63
2429.548	83.31			90.87	-7.56	Average	2434.872	78.96			86.50	-7.54
2429.548	93.58			101.14	-7.56	Peak	2434.872	88.71			96.25	-7.54
2487.870	43.98	54.00	-10.02	51.31	-7.33	Average	2484.724	41.56	54.00	-12.44	48.90	-7.34
2487.870	57.18	74.00	-16.82	64.51	-7.33	Peak	2484.724	54.68	74.00	-19.32	62.02	-7.34
4874.000	31.47	54.00	-22.53	30.67	0.80	Average	4874.000	35.75	54.00	-18.25	34.95	0.80
4874.000	45.26	74.00	-28.74	44.46	0.80	Peak	4874.000	45.64	74.00	-28.36	44.84	0.80
7311.000	34.63	54.00	-19.37	28.99	5.64	Average	7311.000	33.78	54.00	-20.22	28.14	5.64
7311.000	47.93	74.00	-26.07	42.29	5.64	Peak	7311.000	47.98	74.00	-26.02	42.34	5.64

High CH												
Horizontal						Vertical						
Freq	Level	Limit	Over	Read		Freq	Level	Limit	Over	Read		
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2449.880	82.22			89.70	-7.48	Average	2449.880	77.16			84.64	-7.48
2449.880	92.28			99.76	-7.48	Peak	2449.880	87.60			95.08	-7.48
2484.080	51.64	54.00	-2.36	58.98	-7.34	Average	2483.960	48.27	54.00	-5.73	55.61	-7.34
2484.080	66.01	74.00	-7.99	73.35	-7.34	Peak	2483.960	63.03	74.00	-10.97	70.37	-7.34
4904.000	30.95	54.00	-23.05	30.11	0.84	Average	4904.000	35.60	54.00	-18.40	34.76	0.84
4904.000	43.86	74.00	-30.14	43.02	0.84	Peak	4904.000	48.96	74.00	-25.04	48.12	0.84
7356.000	34.44	54.00	-19.56	28.62	5.82	Average	7356.000	34.74	54.00	-19.26	28.92	5.82
7356.000	48.25	74.00	-25.75	42.43	5.82	Peak	7356.000	47.51	74.00	-26.49	41.69	5.82

**Above 1G (1 GHz-26.5 GHz): Worst mode:**

Level = Read Level + Factor

Over Limit = Level – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

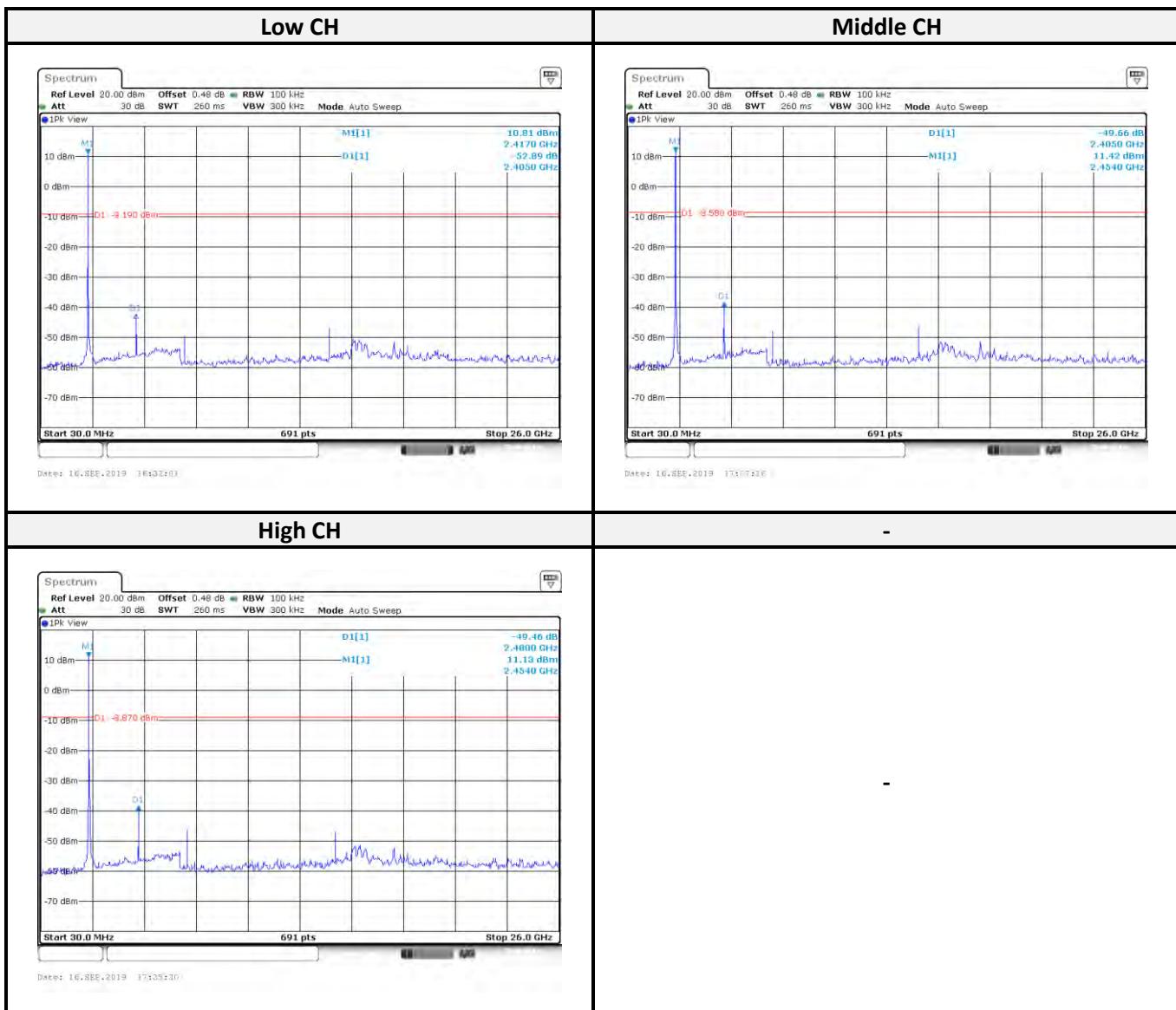
Spurious emissions more than 20 dB below the limit were not reported

**Conducted Spurious Emissions:**

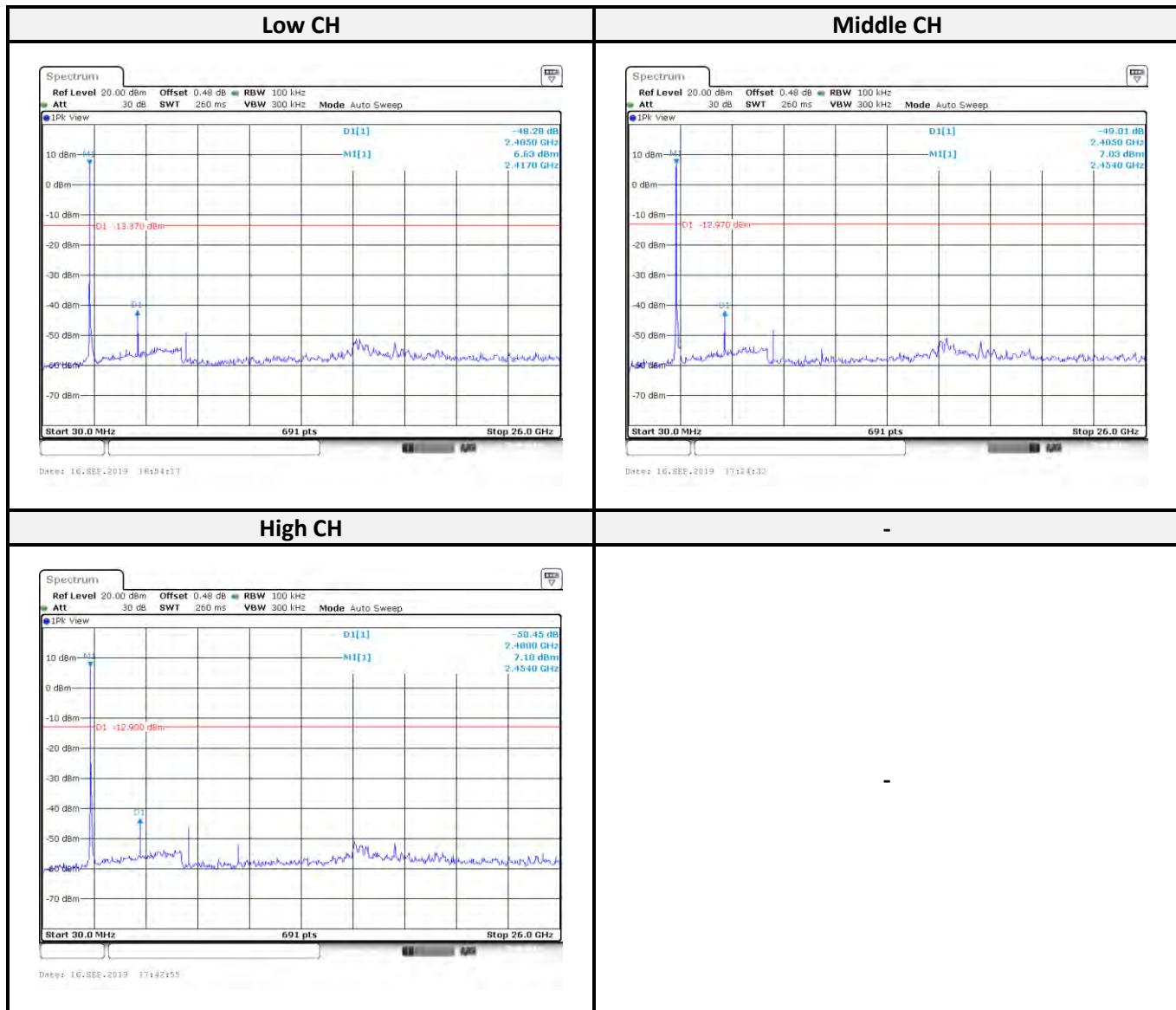
Temperature:	25.5-26.4°C	Relative Humidity:	54-58% RH
Test Date:	2019-09-16 – 2019-09-19	Test Engineer:	Ethan Shi
Test Voltage	120V/60Hz	Mode	Tx mode

Configuration	Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
802.11b mode Chain 0	Low	2412	52.89	≥ 20	Compliance
	Mid	2437	49.66	≥ 20	Compliance
	High	2462	49.46	≥ 20	Compliance
802.11b mode Chain 1	Low	2412	48.28	≥ 20	Compliance
	Mid	2437	49.01	≥ 20	Compliance
	High	2462	50.45	≥ 20	Compliance
802.11g mode Chain 0	Low	2412	55.10	≥ 20	Compliance
	Mid	2437	55.02	≥ 20	Compliance
	High	2462	55.31	≥ 20	Compliance
802.11g mode Chain 1	Low	2412	50.86	≥ 20	Compliance
	Mid	2437	52.56	≥ 20	Compliance
	High	2462	51.40	≥ 20	Compliance
802.11n HT20 mode Chain 0	Low	2412	50.96	≥ 20	Compliance
	Mid	2437	50.64	≥ 20	Compliance
	High	2462	51.35	≥ 20	Compliance
802.11n HT20 mode Chain 1	Low	2412	50.55	≥ 20	Compliance
	Mid	2437	51.64	≥ 20	Compliance
	High	2462	51.67	≥ 20	Compliance
802.11n HT40 mode Chain 0	Low	2422	47.56	≥ 20	Compliance
	Mid	2437	47.35	≥ 20	Compliance
	High	2452	47.82	≥ 20	Compliance
802.11n HT40 mode Chain 1	Low	2422	47.03	≥ 20	Compliance
	Mid	2437	47.62	≥ 20	Compliance
	High	2452	48.36	≥ 20	Compliance

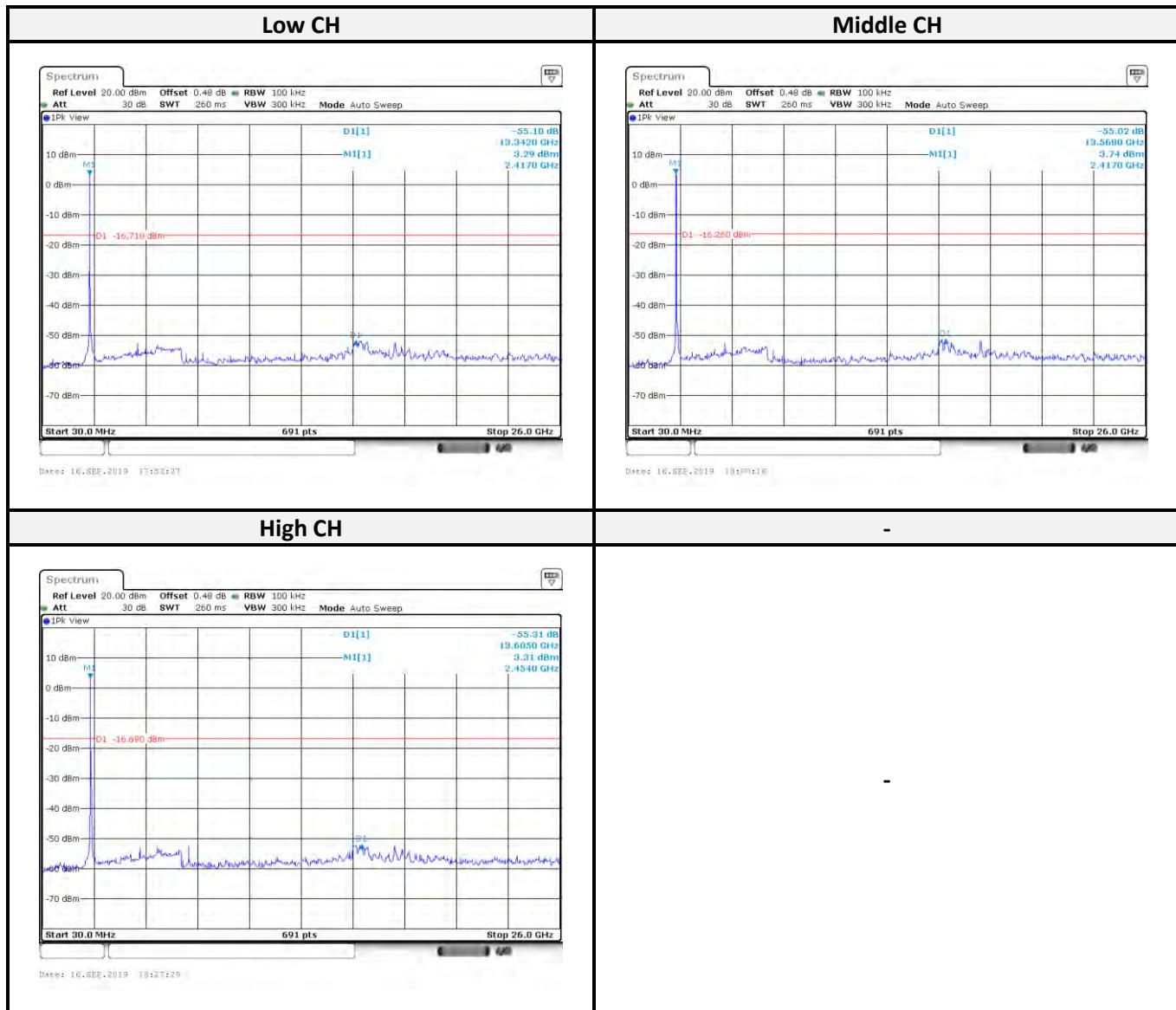
## 802.11b mode Chain 0:



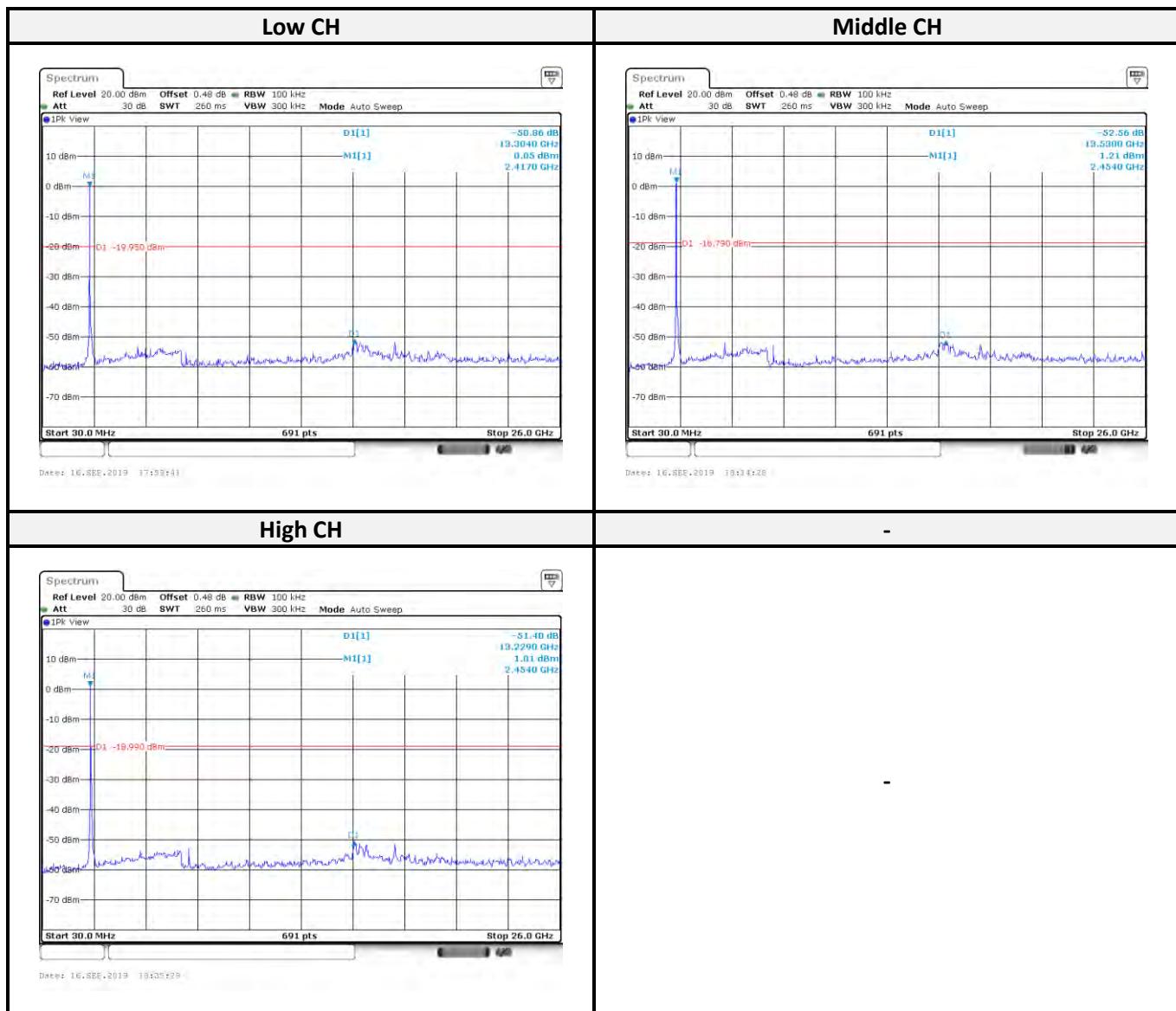
## 802.11b mode Chain 1:



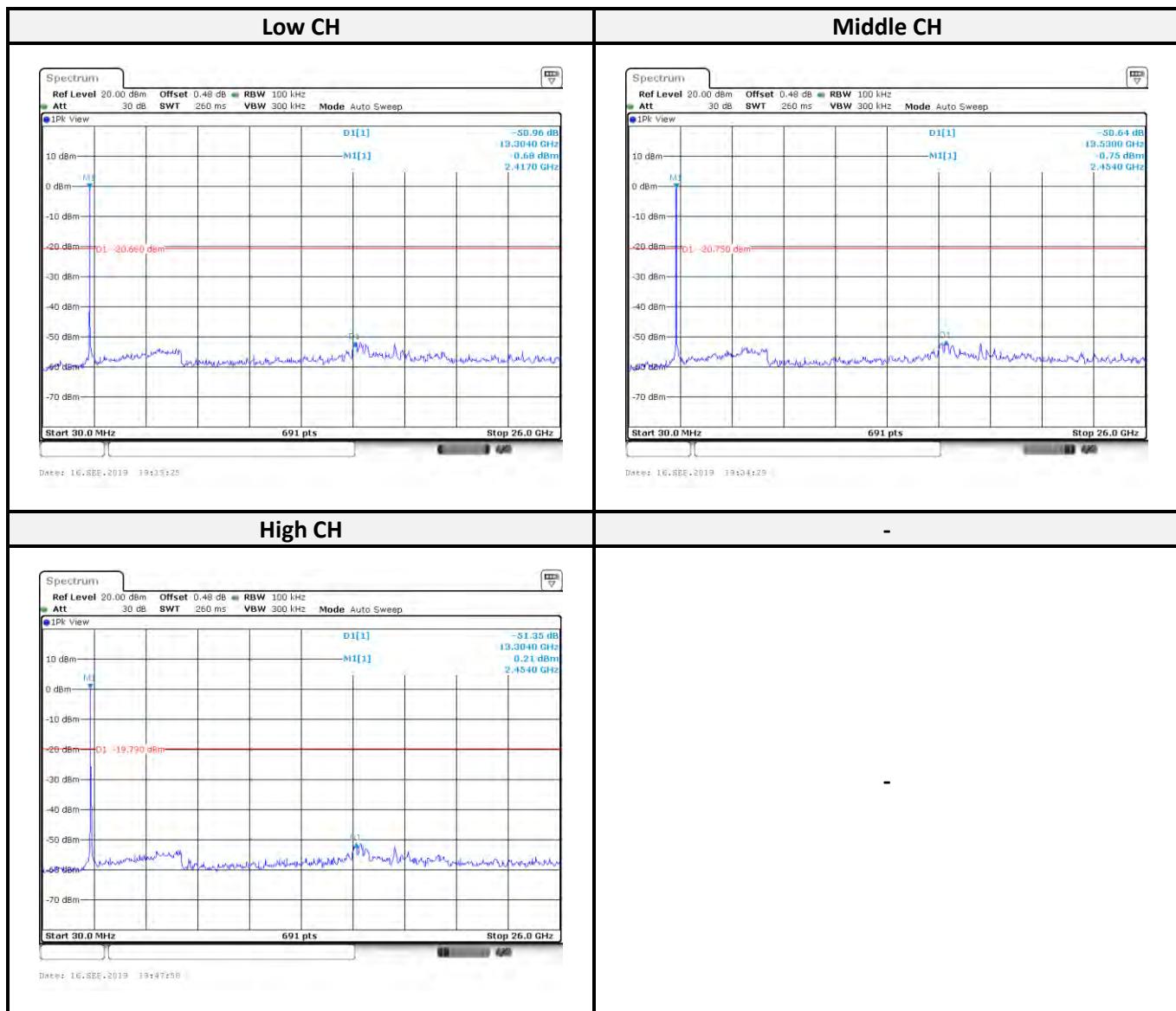
## 802.11g mode Chain 0:



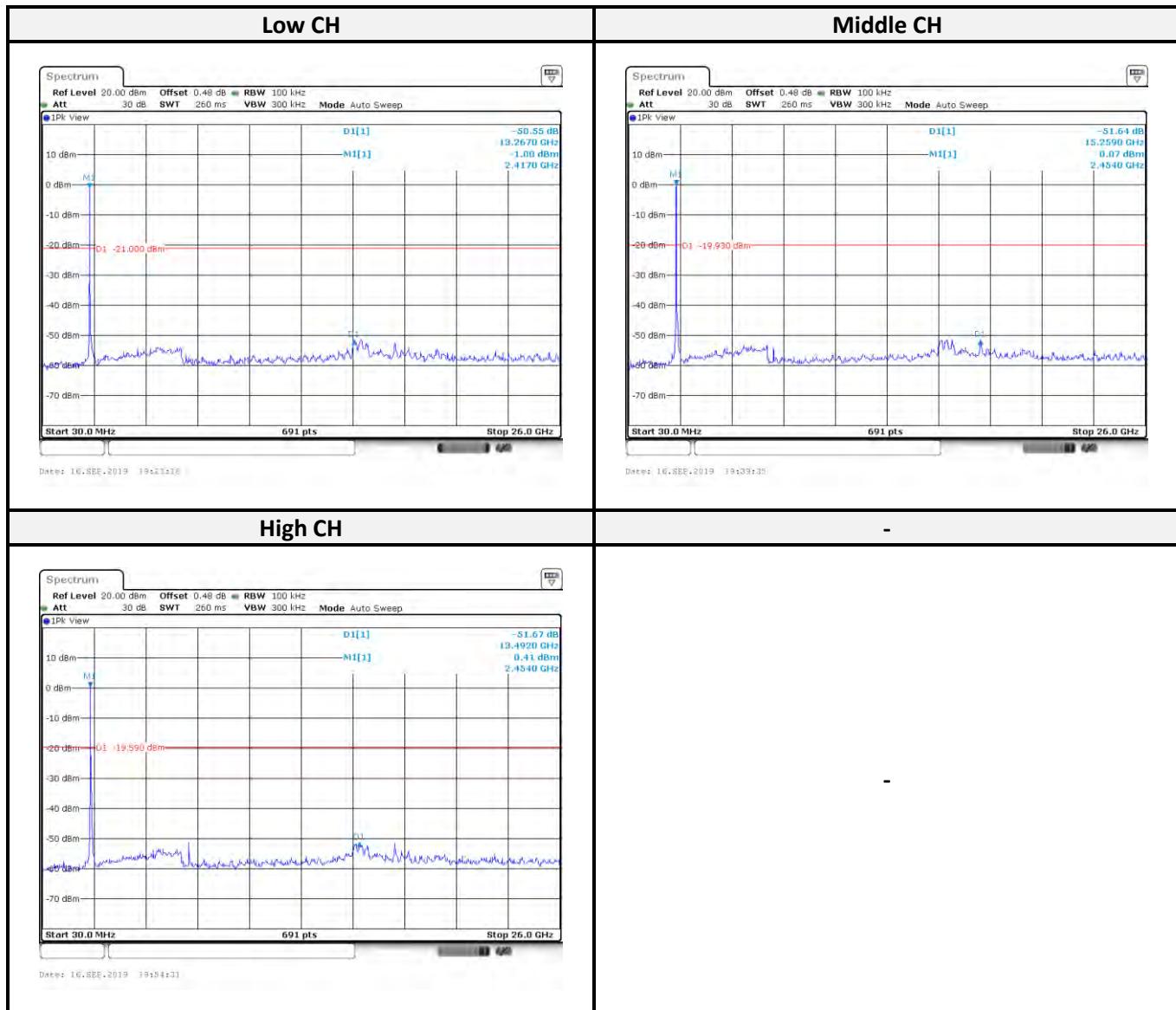
## 802.11g mode Chain 1:



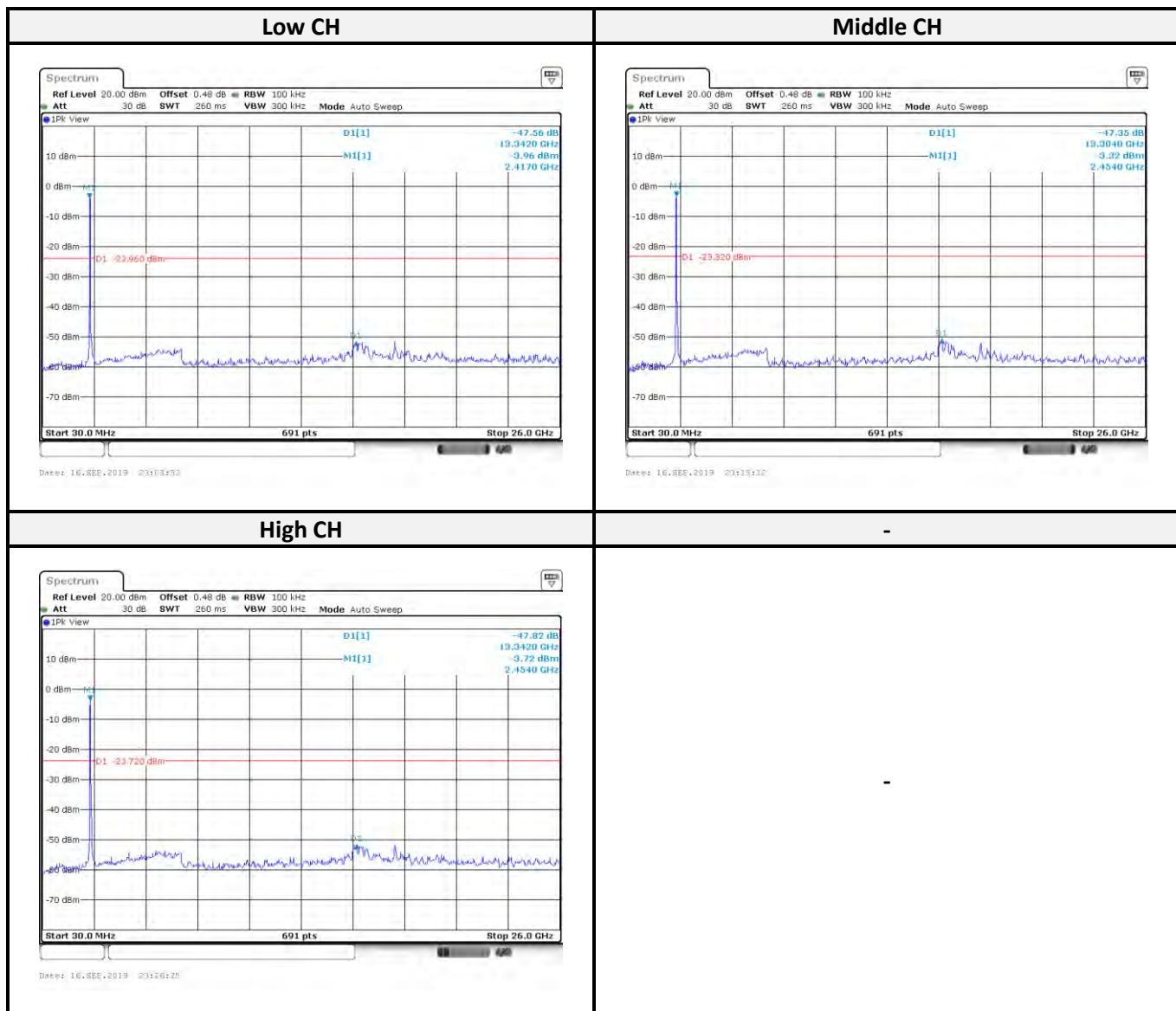
## 802.11n HT20 mode chain0:



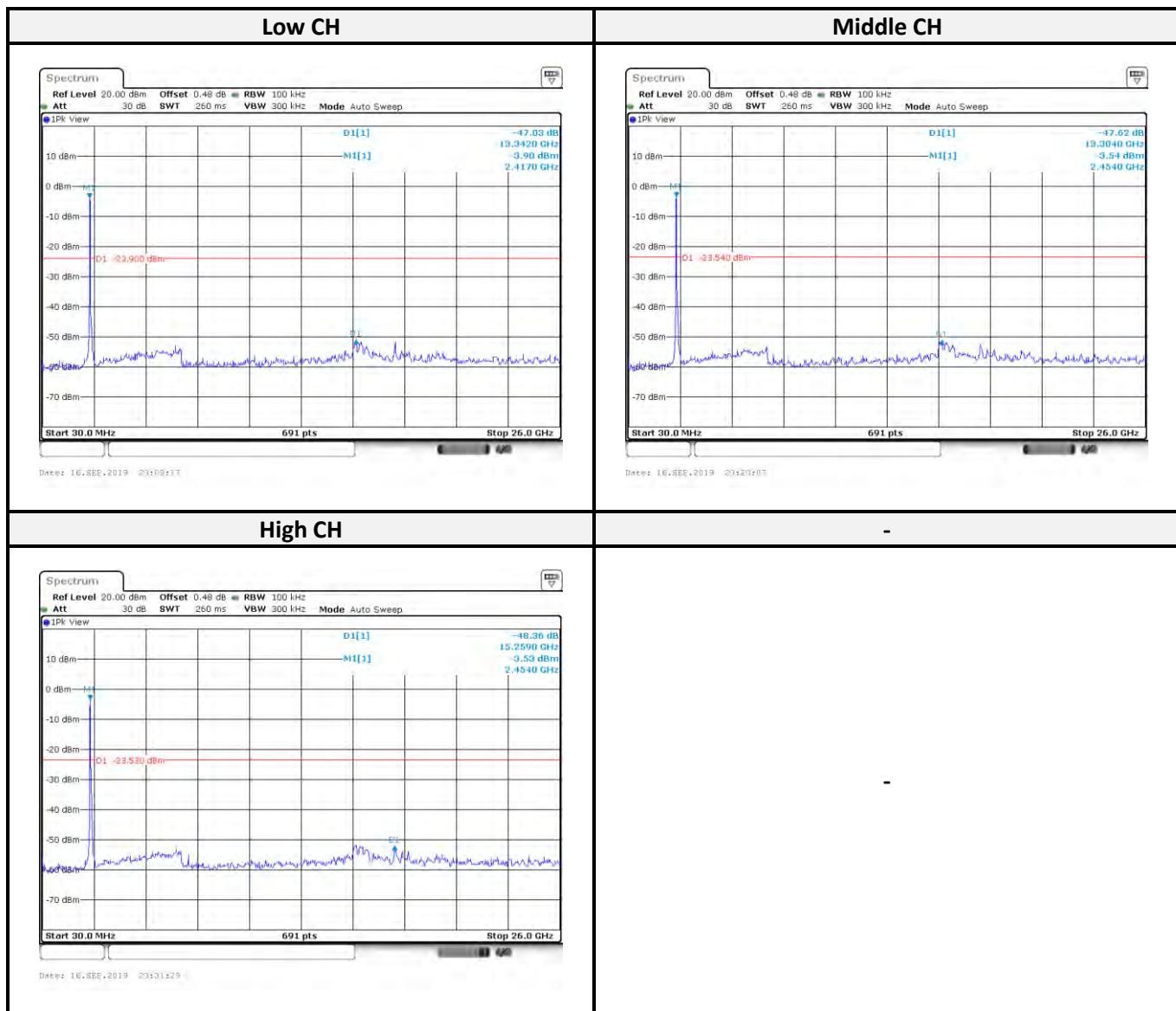
## 802.11n HT20 mode Chain 1:



## 802.11n HT40 mode Chain 0:



## 802.11n HT40 mode Chain 1:



## 9 FCC §15.247(a)(2) and RSS-247 Sec 5.2– 6 dB Emission Bandwidth and Occupied Bandwidth

### 9.1 Applicable Standard

According to FCC §15.247(a) (2),

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

According to RSS-247 §5.2 a),

The minimum 6 dB bandwidth shall be 500 kHz.

According to RSS-Gen §6.7,

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

In some cases, the “x dB bandwidth” is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated x dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth:

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to “Sample”. However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or “Max Hold”) may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

## 9.2 Test Procedure

### 6 dB Emission Bandwidth

According to ANSI C63.10-2013, the steps for the first option are as follows:

(1) Set RBW = 100 kHz. (2) Set the VBW  $\geq [3 \times \text{RBW}]$ . (3) Detector = peak. (4) Trace mode = max hold.  
(5) Sweep = auto couple. (6) Allow the trace to stabilize. (7) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

### 99% Emission Bandwidth

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

The following procedure shall be used for measuring 99% power bandwidth:

- a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.
- b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.
- c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than  $[10 \log (\text{OBW}/\text{RBW})]$  below the reference level. Specific guidance is given in 4.1.5.2.
- d) Step a) through step c) might require iteration to adjust within the specified range.

- e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
- f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.
- g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.
- h) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

### 9.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
<b>Conducted Room(TH-01)</b>					
Signal Analyzer 40GHZ	Rohde & Schwarz	FSV40-N	102248	2019/09/11	2020/09/10
Cable	MTJ	MT40S	620620-MT40S-100	2018/12/28	2019/12/27

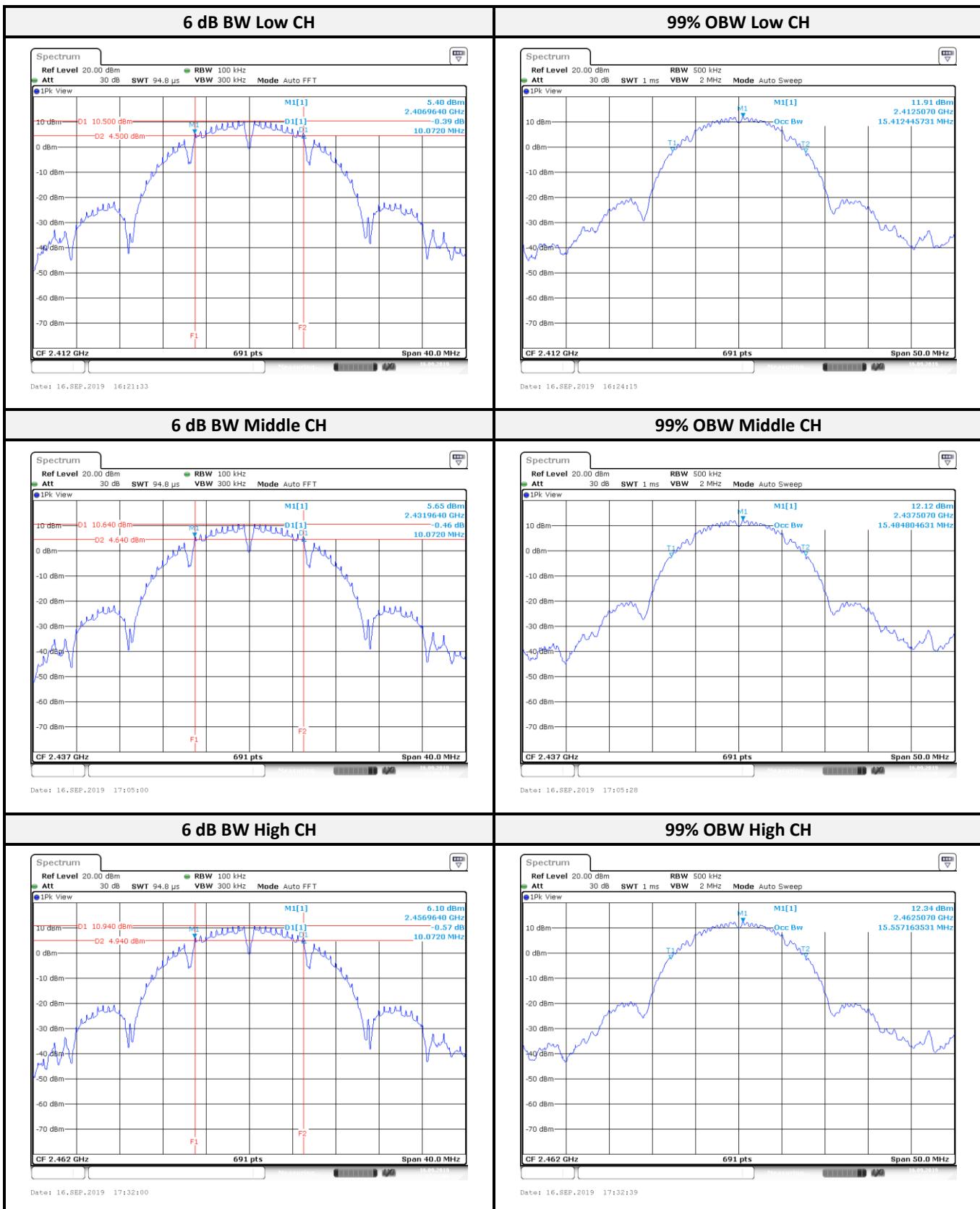
**\*Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

#### 9.4 Test Results

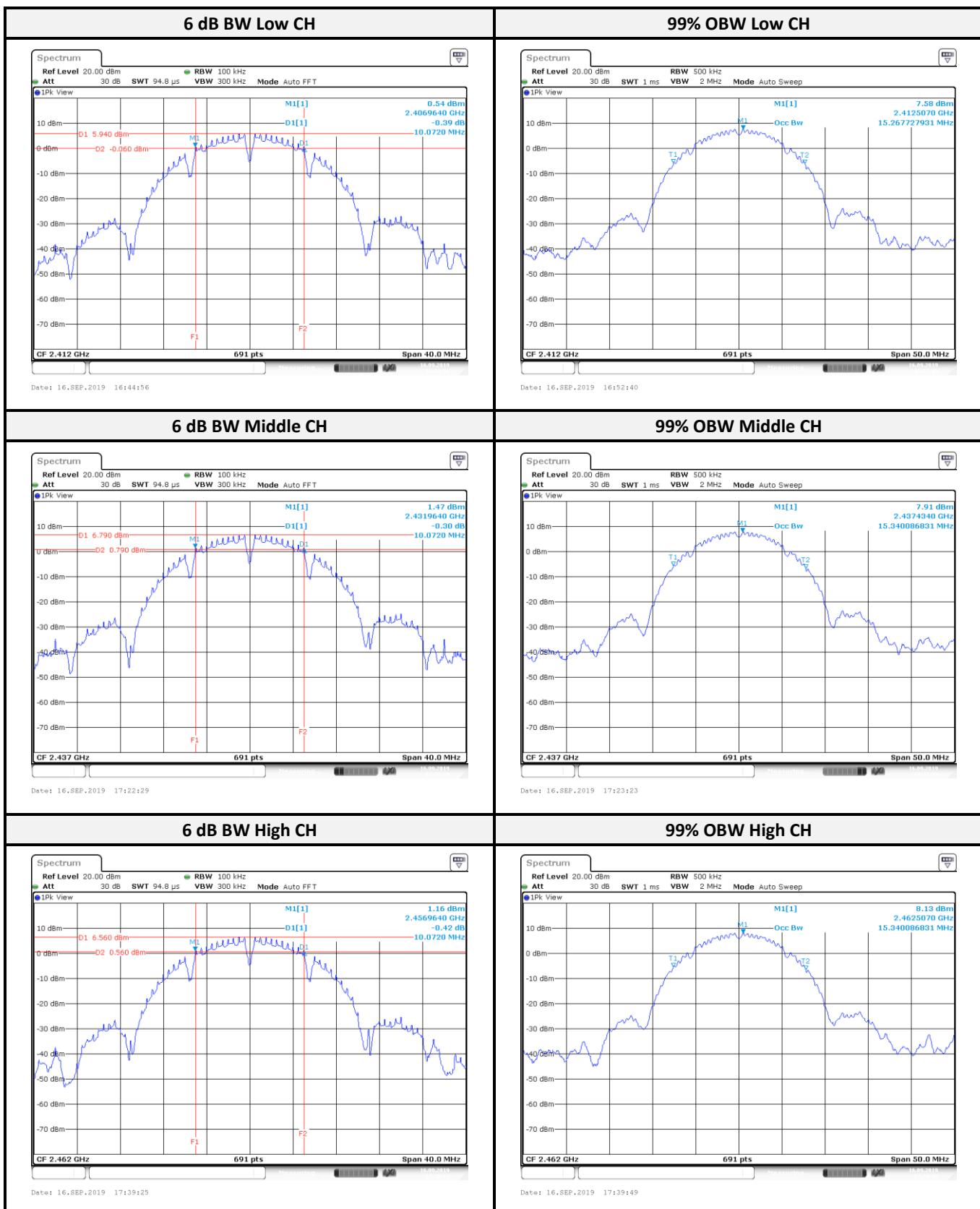
Temperature:	25-5-26.4°C	Relative Humidity:	54-58% RH
Test Date:	2019-09-16 – 2019-09-19	Test Engineer:	Ethan Shao
Test Voltage	120V/60Hz	Mode	Tx mode

Configuration	Channel	Frequency (MHz)	99% OBW (MHz)	6 dB BW (MHz)	6dB Limit (MHz)	Result
802.11b mode Chain 0	Low	2412	15.41	10.07	> 0.5	Compliance
	Middle	2437	15.48	10.07	> 0.5	Compliance
	High	2462	15.56	10.07	> 0.5	Compliance
802.11b mode Chain 1	Low	2412	15.27	10.07	> 0.5	Compliance
	Middle	2437	15.34	10.07	> 0.5	Compliance
	High	2462	15.34	10.07	> 0.5	Compliance
802.11g mode Chain 0	Low	2412	17.95	16.61	> 0.5	Compliance
	Middle	2437	17.95	16.61	> 0.5	Compliance
	High	2462	17.95	16.61	> 0.5	Compliance
802.11g mode Chain 1	Low	2412	18.23	16.61	> 0.5	Compliance
	Middle	2437	19.18	16.61	> 0.5	Compliance
	High	2462	18.88	16.61	> 0.5	Compliance
802.11n HT20 mode Chain 0	Low	2412	18.60	17.83	> 0.5	Compliance
	Middle	2437	18.60	17.83	> 0.5	Compliance
	High	2462	18.60	17.83	> 0.5	Compliance
802.11n HT20 mode Chain 1	Low	2412	19.10	17.83	> 0.5	Compliance
	Middle	2437	19.32	17.83	> 0.5	Compliance
	High	2462	19.46	17.83	> 0.5	Compliance
802.11n HT40 mode Chain 0	Low	2422	36.90	36.58	> 0.5	Compliance
	Middle	2437	36.90	36.58	> 0.5	Compliance
	High	2452	36.90	36.58	> 0.5	Compliance
802.11n HT40 mode Chain 1	Low	2422	37.19	36.58	> 0.5	Compliance
	Middle	2437	37.19	36.58	> 0.5	Compliance
	High	2452	37.34	36.58	> 0.5	Compliance

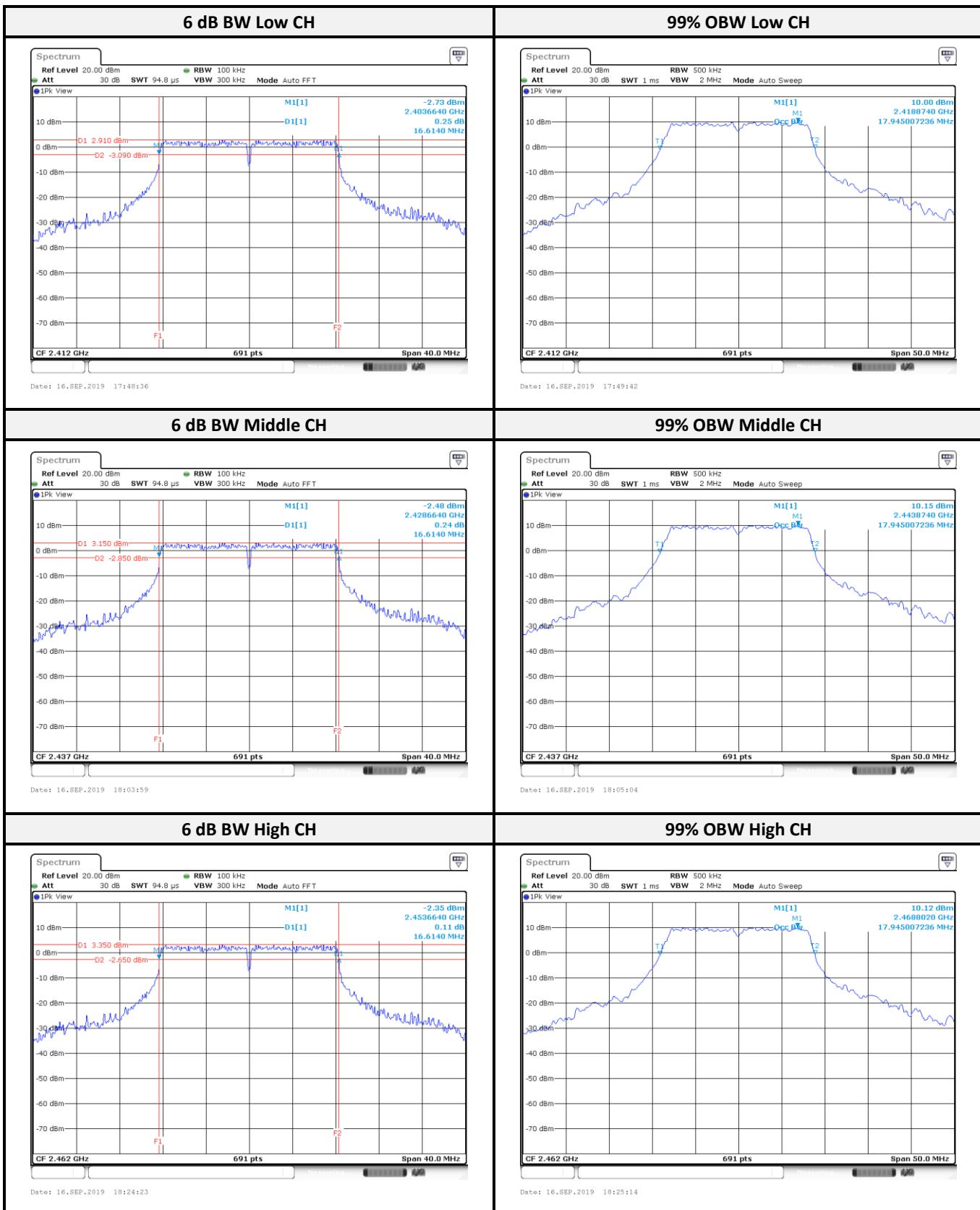
## 802.11b mode Chain 0:



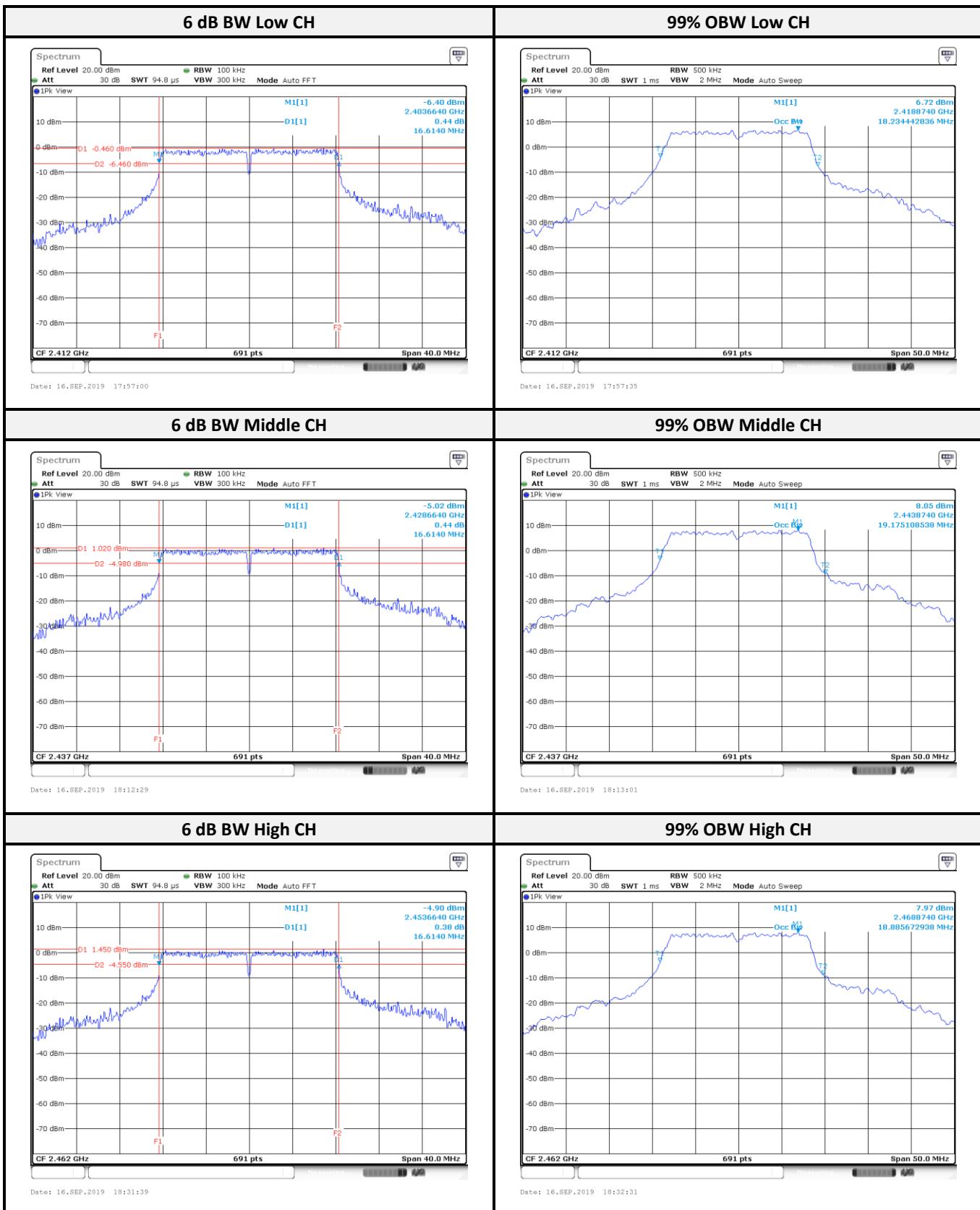
## 802.11b mode Chain 1:



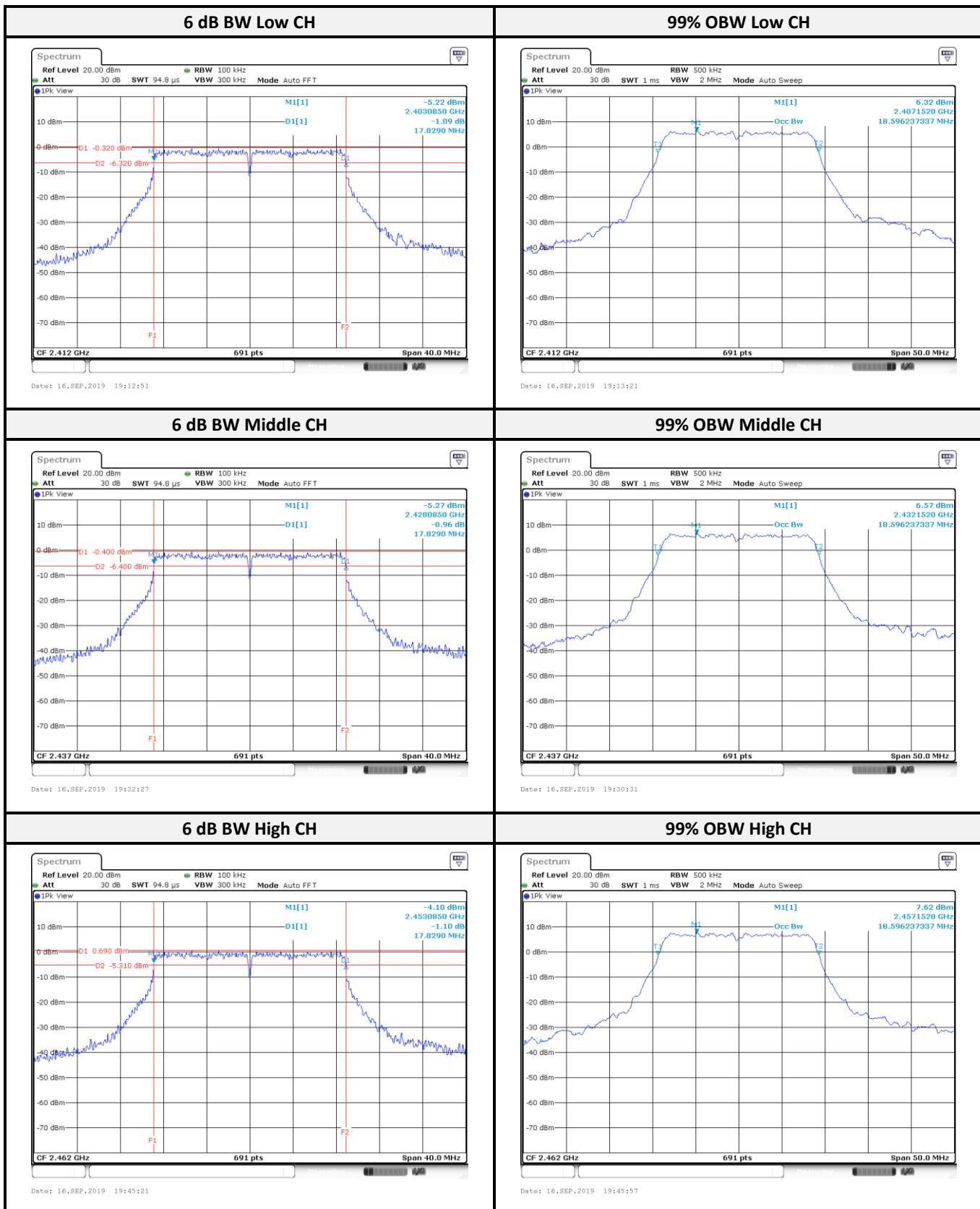
## 802.11g mode Chain 0:



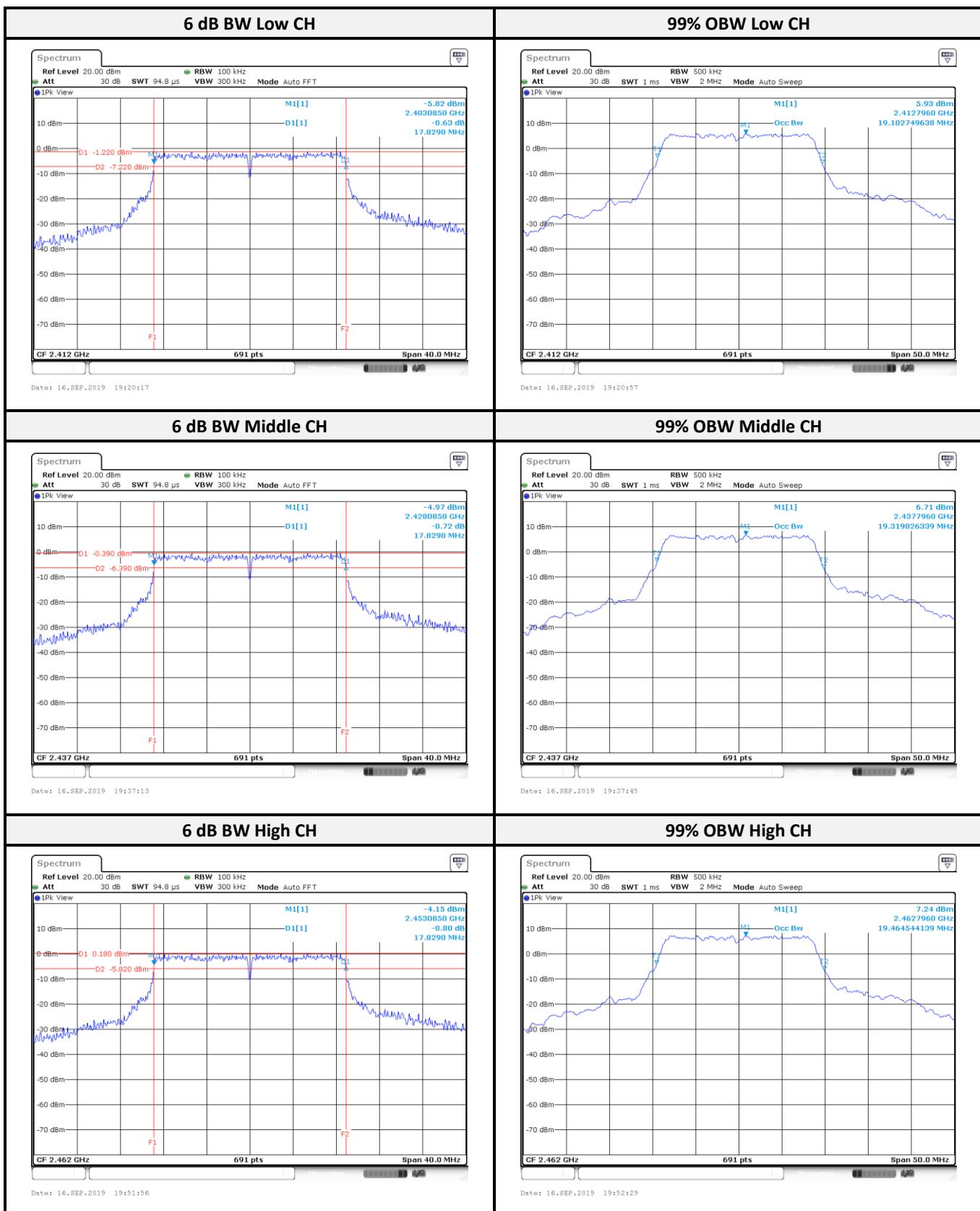
## 802.11g mode Chain 1:



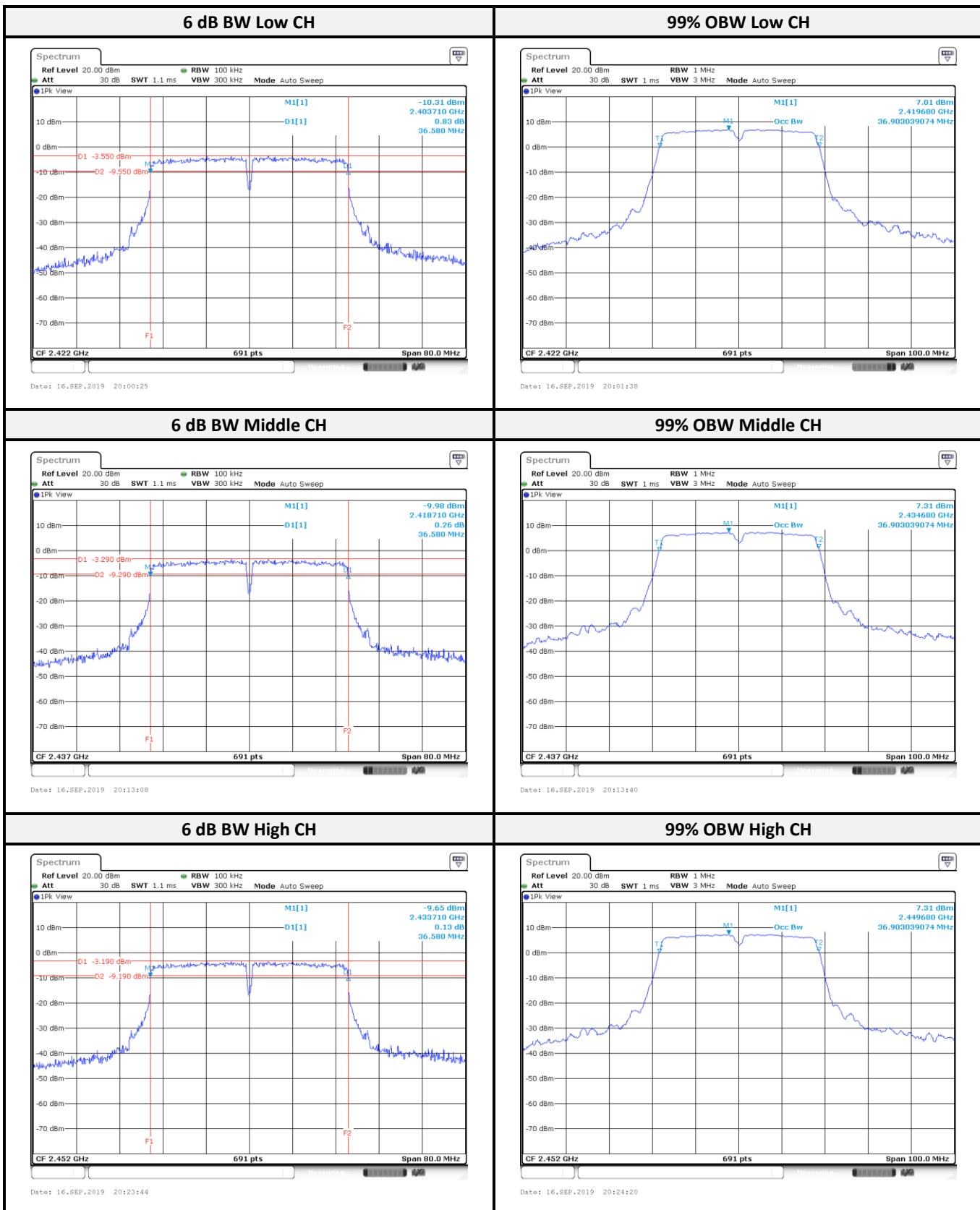
## 802.11n HT20 mode Chain0:



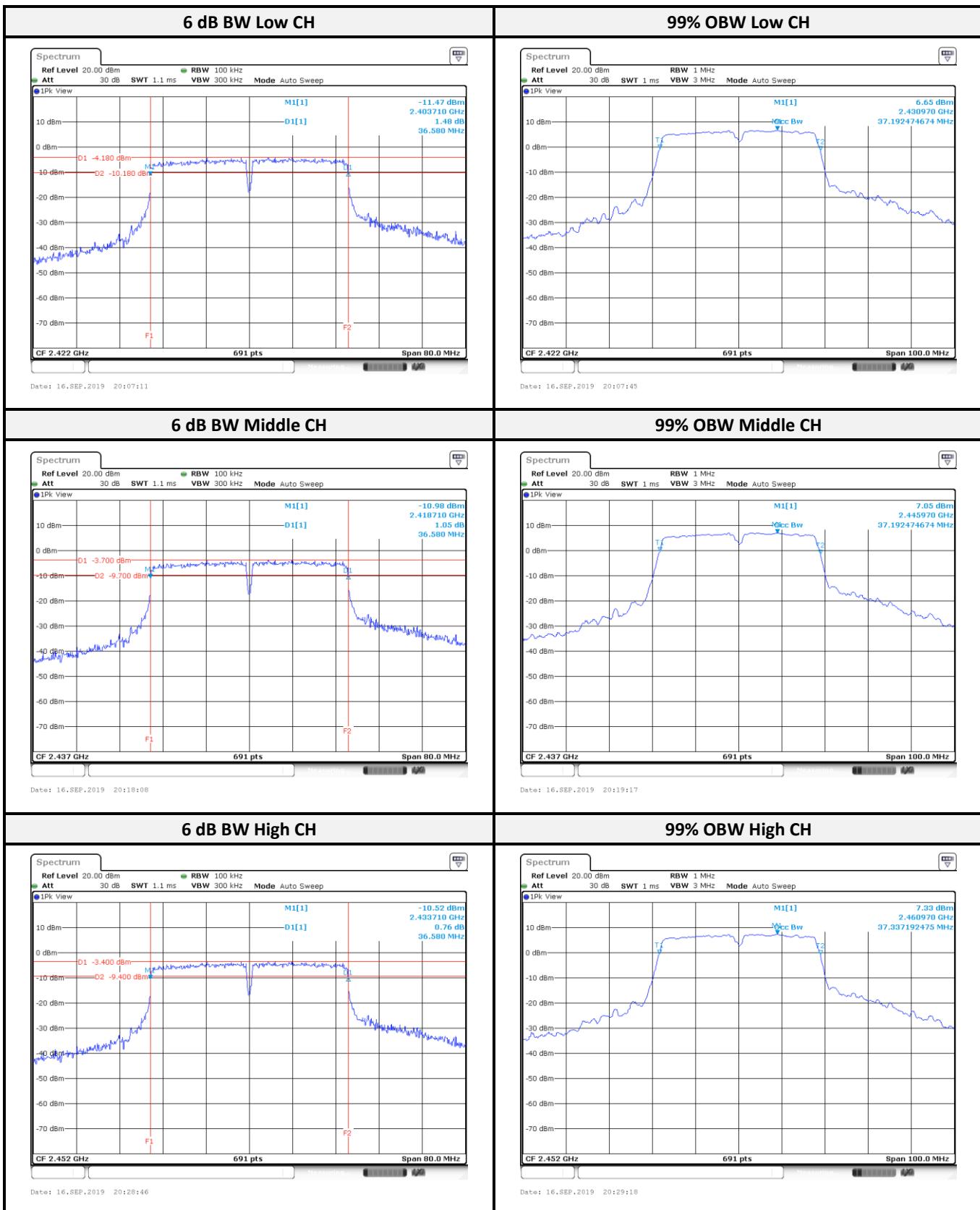
## 802.11n HT20 mode Chain1:



## 802.11n HT40 mode Chain0:



## 802.11n HT40 mode Chain1:



## 10 FCC §15.247(b) (3) and RSS-247 Sec 5.4(d) – Maximum Output Power

### 10.1 Applicable Standard

According to FCC §15.247(b) (3),

Systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to RSS-247 §5.4(d).

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

### 10.2 Test Procedure

(1) Place the EUT on a bench and set it in transmitting mode.

(2) Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to measuring equipment. (3). Add a correction factor to the display.

### 10.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
<b>Conducted Room(TH-01)</b>					
Power Sensor	Agilent	U2021XA	MY54250014	2019/03/06	2020/03/05
Cable	MTJ	MT40S	620620-MT40S-100	2018/12/28	2019/12/27

**\*Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

### 10.4 Test Environmental Conditions

Temperature:	26.4°C	Relative Humidity:	57% RH
Test Date:	2019-09-19	Test Engineer:	Ethan Shao
Test Voltage	120V/60Hz	Mode	Tx mode

## 10.5 Test Results

Channel	Frequency (MHz)	Chain0 Peak Output Power (dBm)	Chain1 Peak Output Power (dBm)	Total Peak Output Power (dBm)	Total Peak Output Power (W)	Limit (dBm)	Result
<b>802.11b mode chain 0</b>							
Low	2412	23.81	-	23.81	0.2404	30	Compliance
Middle	2437	23.97	-	23.97	0.2495	30	Compliance
High	2462	23.92	-	23.92	0.2466	30	Compliance
<b>802.11b mode chain 1</b>							
Low	2412	-	25.32	25.32	0.3404	30	Compliance
Middle	2437	-	25.33	25.33	0.3412	30	Compliance
High	2462	-	25.17	25.17	0.3289	30	Compliance
<b>802.11g mode chain 0</b>							
Low	2412	19.67	-	19.67	0.0927	30	Compliance
Middle	2437	19.63	-	19.63	0.0918	30	Compliance
High	2462	19.91	-	19.91	0.0979	30	Compliance
<b>802.11g mode chain 1</b>							
Low	2412	-	22.20	22.20	0.1660	30	Compliance
Middle	2437	-	23.11	23.11	0.2046	30	Compliance
High	2462	-	22.84	22.84	0.1923	30	Compliance
<b>802.11n HT20 mode</b>							
Low	2412	21.94	21.24	24.61	0.2891	30	Compliance
Middle	2437	22.98	21.62	25.36	0.3436	30	Compliance
High	2462	23.11	21.98	25.59	0.3622	30	Compliance
<b>802.11n HT40 mode</b>							
Low	2422	21.88	20.14	24.11	0.2576	30	Compliance
Middle	2437	21.37	21.18	24.29	0.2685	30	Compliance
High	2452	21.87	21.38	24.64	0.2911	30	Compliance

## 11 FCC §15.247(d) and RSS-247 Sec 5.5 – 100 kHz Bandwidth of Frequency Band Edge

### 11.1 Applicable Standard

According to FCC §15.247(d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

According to RSS-247 §5.5. In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

### 11.2 Test Procedure

- (1) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- (2) Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- (3) Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
- (4) Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.

### 11.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
<b>Conducted Room(TH-01)</b>					
Signal Analyzer 40GHZ	Rohde & Schwarz	FSV40-N	102248	2019/09/11	2020/09/10
Cable	MTJ	MT40S	620620-MT40S-100	2018/12/28	2019/12/27

**\*Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

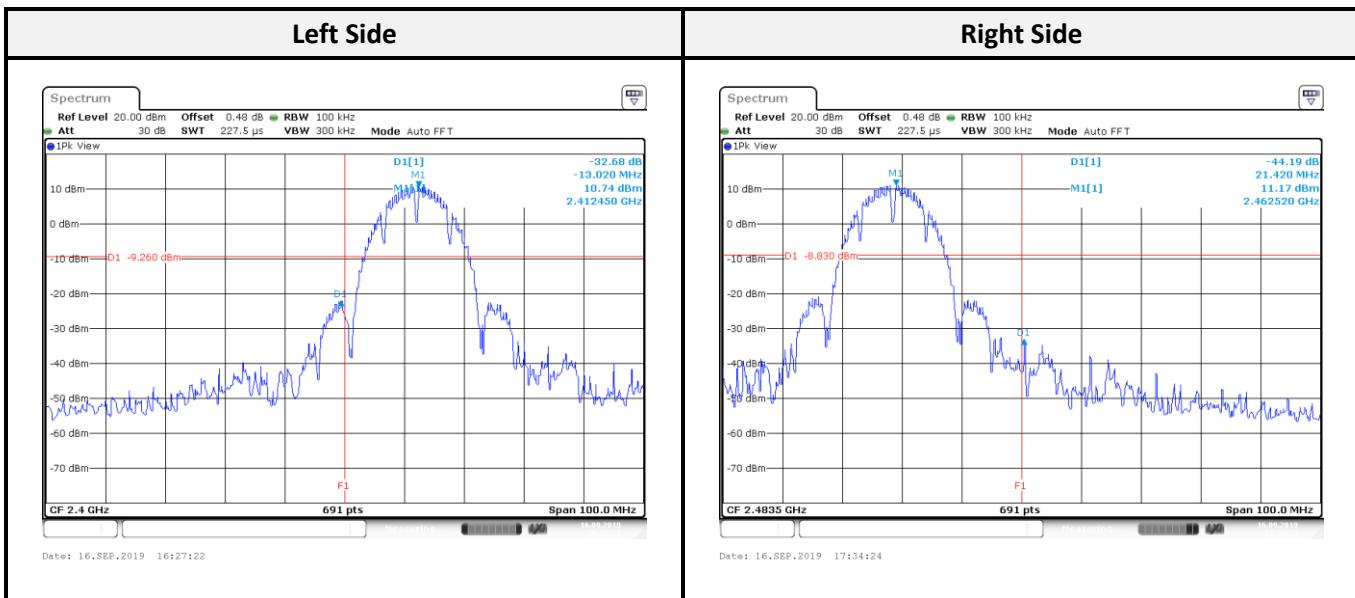
### 11.4 Test Environmental Conditions

<b>Temperature:</b>	25.5-26.4°C	<b>Relative Humidity:</b>	54-58% RH
<b>Test Date:</b>	2019-09-16 – 2019-09-19	<b>Test Engineer:</b>	Ethan Shao
<b>Test Voltage</b>	120V/60Hz	<b>Mode</b>	Tx mode

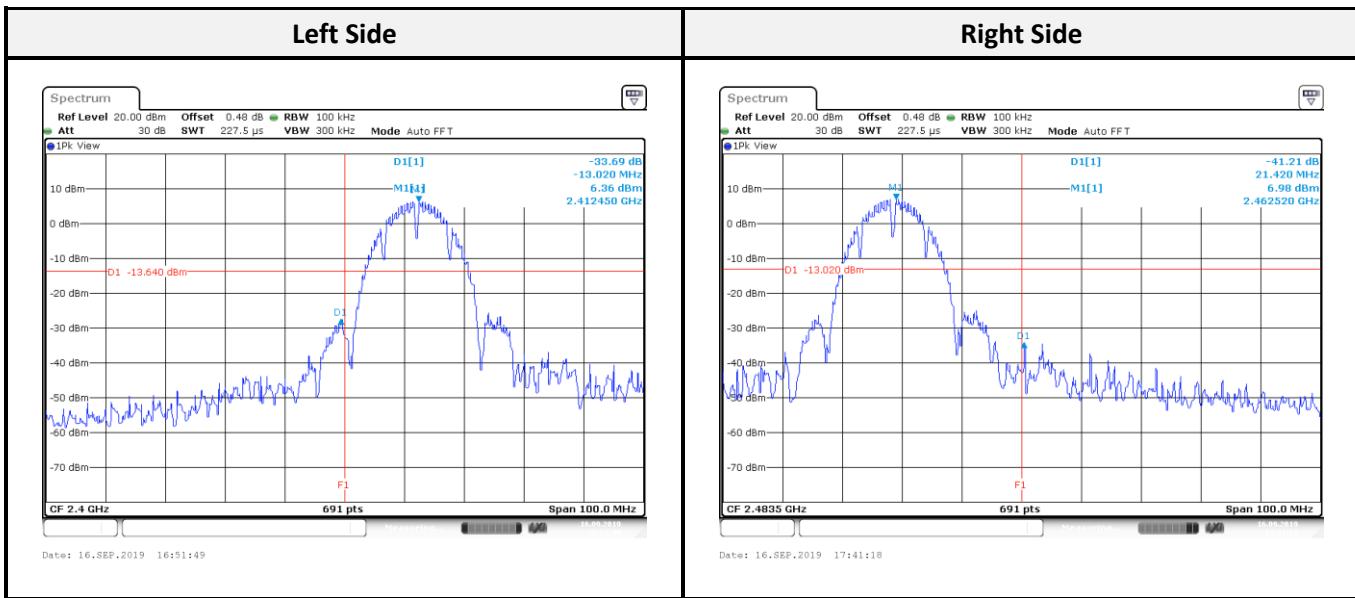
## 11.5 Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
<b>802.11b mode Chain0</b>				
Low	2412	32.68	≥ 20	Compliance
High	2462	44.19	≥ 20	Compliance
<b>802.11b mode Chain1</b>				
Low	2412	33.69	≥ 20	Compliance
High	2462	41.21	≥ 20	Compliance
<b>802.11g mode Chain0</b>				
Low	2412	28.87	≥ 20	Compliance
High	2462	35.69	≥ 20	Compliance
<b>802.11g mode Chain1</b>				
Low	2412	26.86	≥ 20	Compliance
High	2462	31.98	≥ 20	Compliance
<b>802.11n HT20 mode Chain0</b>				
Low	2412	32.99	≥ 20	Compliance
High	2462	39.03	≥ 20	Compliance
<b>802.11n HT20 mode Chain1</b>				
Low	2412	28.82	≥ 20	Compliance
High	2462	31.78	≥ 20	Compliance
<b>802.11n HT40 mode Chain0</b>				
Low	2422	33.10	≥ 20	Compliance
High	2452	34.93	≥ 20	Compliance
<b>802.11n HT40 mode Chain1</b>				
Low	2422	33.10	≥ 20	Compliance
High	2452	34.93	≥ 20	Compliance

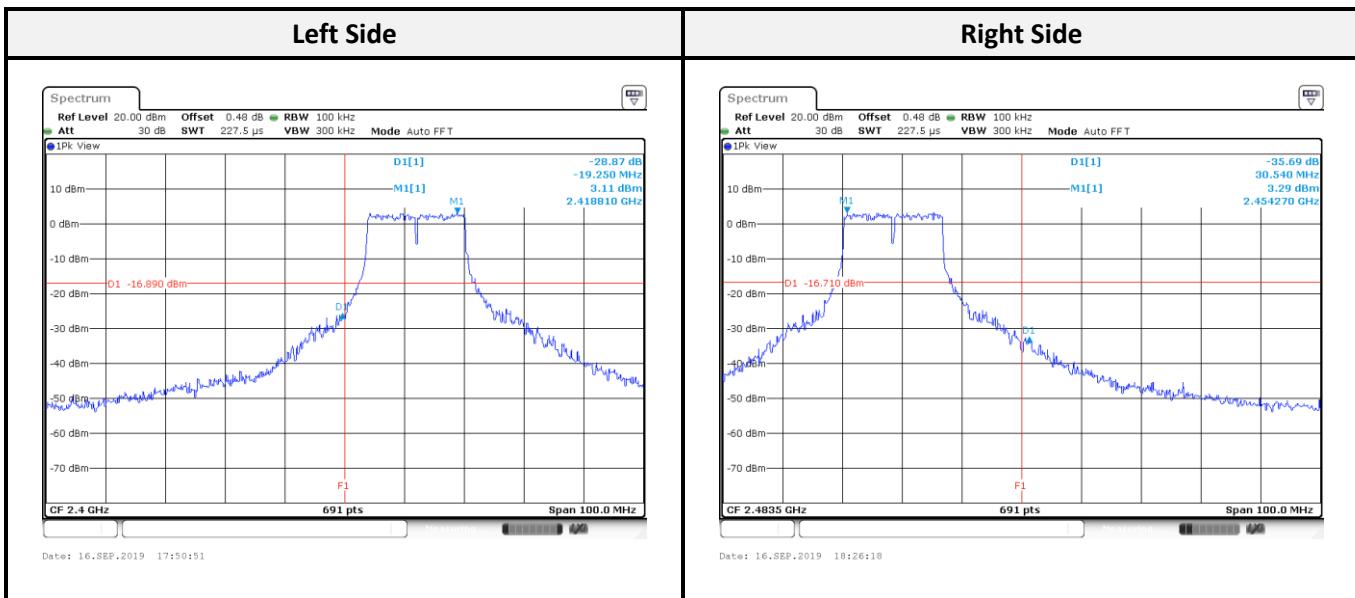
## 802.11b mode Chain0:



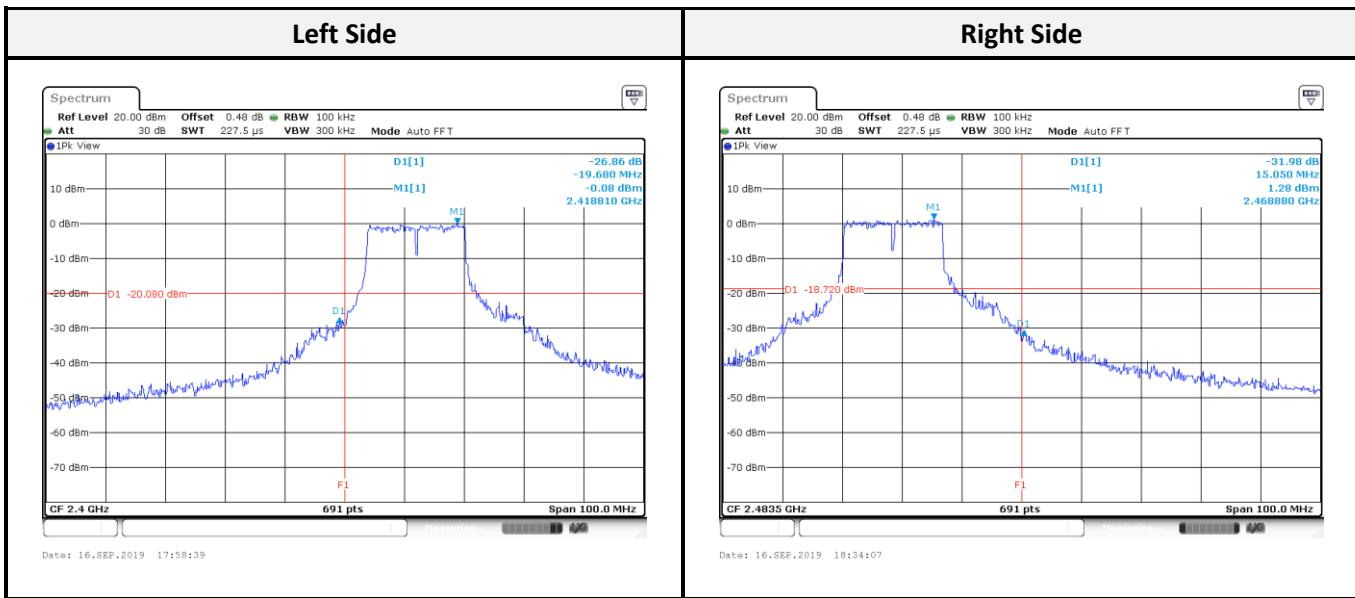
## 802.11b mode Chain1:



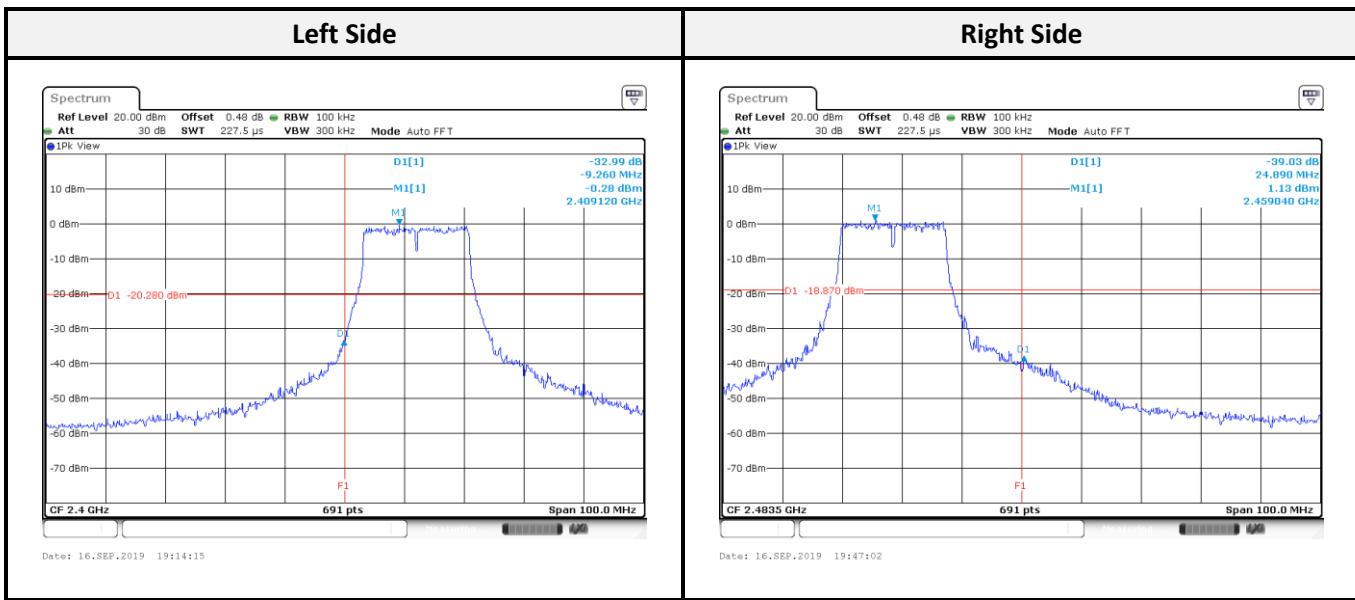
## 802.11g mode Chain0:



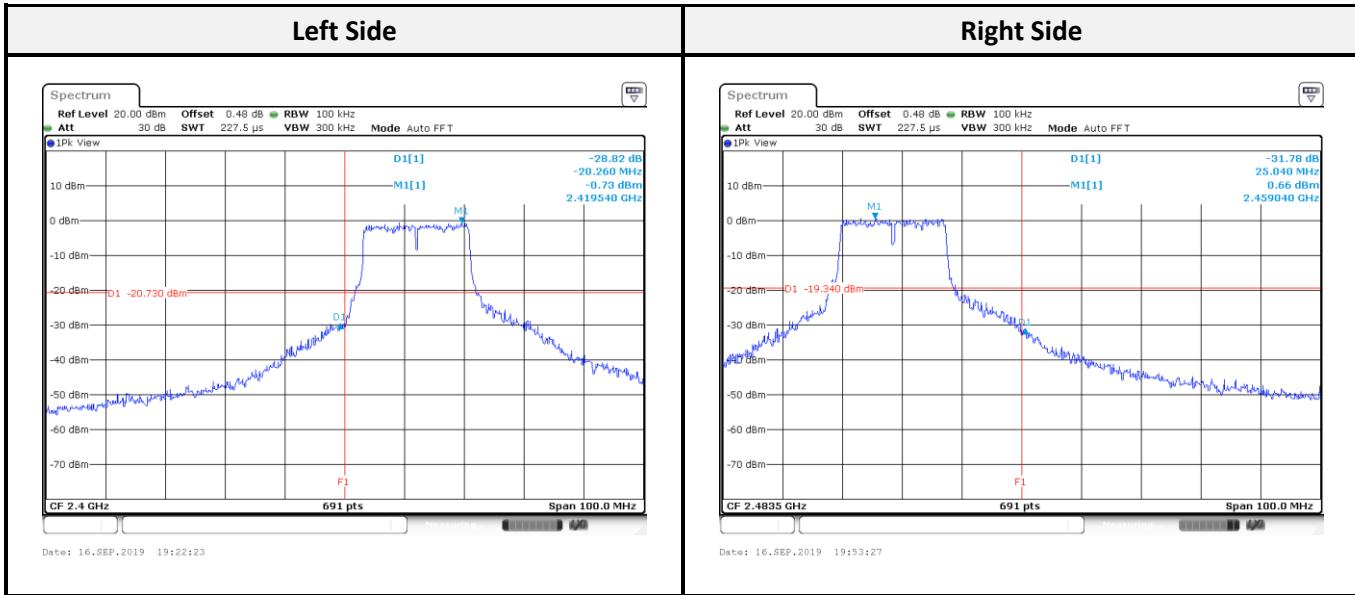
## 802.11g mode Chain1:



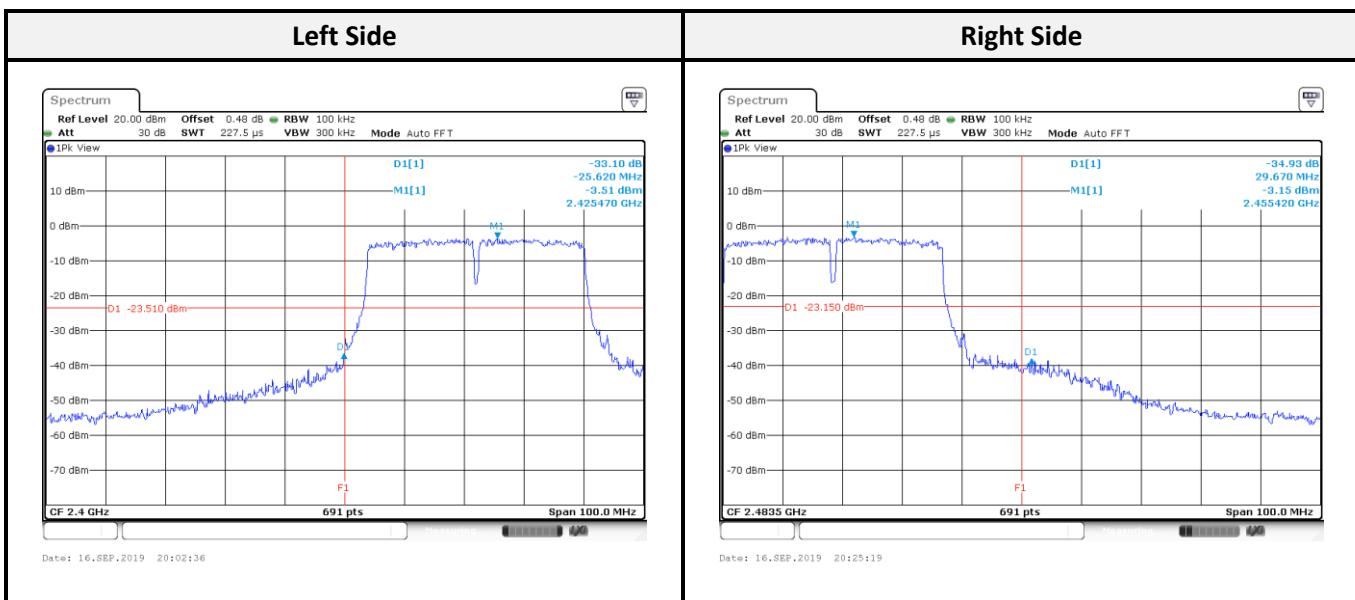
## 802.11n HT20 mode Chain0:



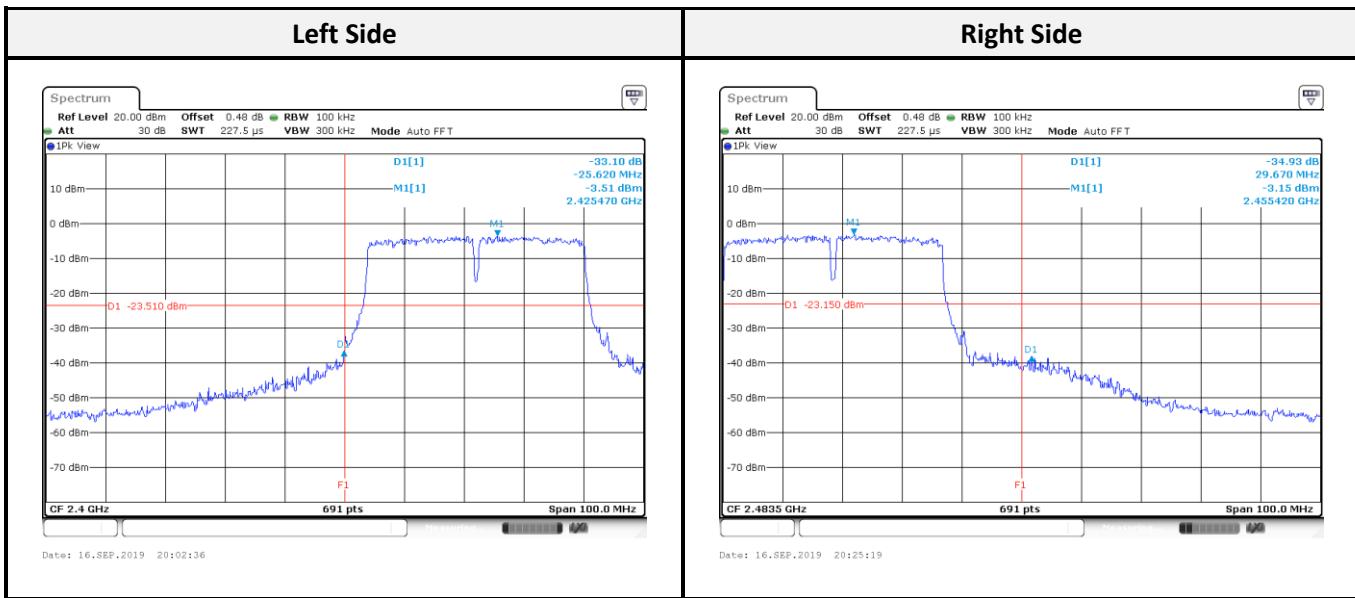
## 802.11n HT20 mode Chain1:



## 802.11n HT40 mode Chain0:



## 802.11n HT40 mode Chain1:



## 12 FCC §15.247(e) and RSS-247 Sec 5.2(b) – Power Spectral Density

### 12.1 Applicable Standard

According to FCC §15.247(e),

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

According to RSS-247 §5.2(b).

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of section 5.4(d), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

### 12.2 Test Procedure

According to ANSI C63.10-2013,

- (1) Set analyzer center frequency to DTS channel center frequency.
- (2) Set the span to 1.5 times the DTS bandwidth. (3) Set the RBW to  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- (4) Set the VBW  $\geq [3 \times \text{RBW}]$ . (5) Detector = peak. (6) Sweep time = auto couple.
- (7) Trace mode = max hold. (8) Allow trace to fully stabilize.
- (9) Use the peak marker function to determine the maximum amplitude level within the RBW.
- (10) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

### 12.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
<b>Conducted Room(TH-01)</b>					
Signal Analyzer 40GHZ	Rohde & Schwarz	FSV40-N	102248	2019/09/11	2020/09/10
Cable	MTJ	MT40S	620620-MT40S-100	2018/12/28	2019/12/27

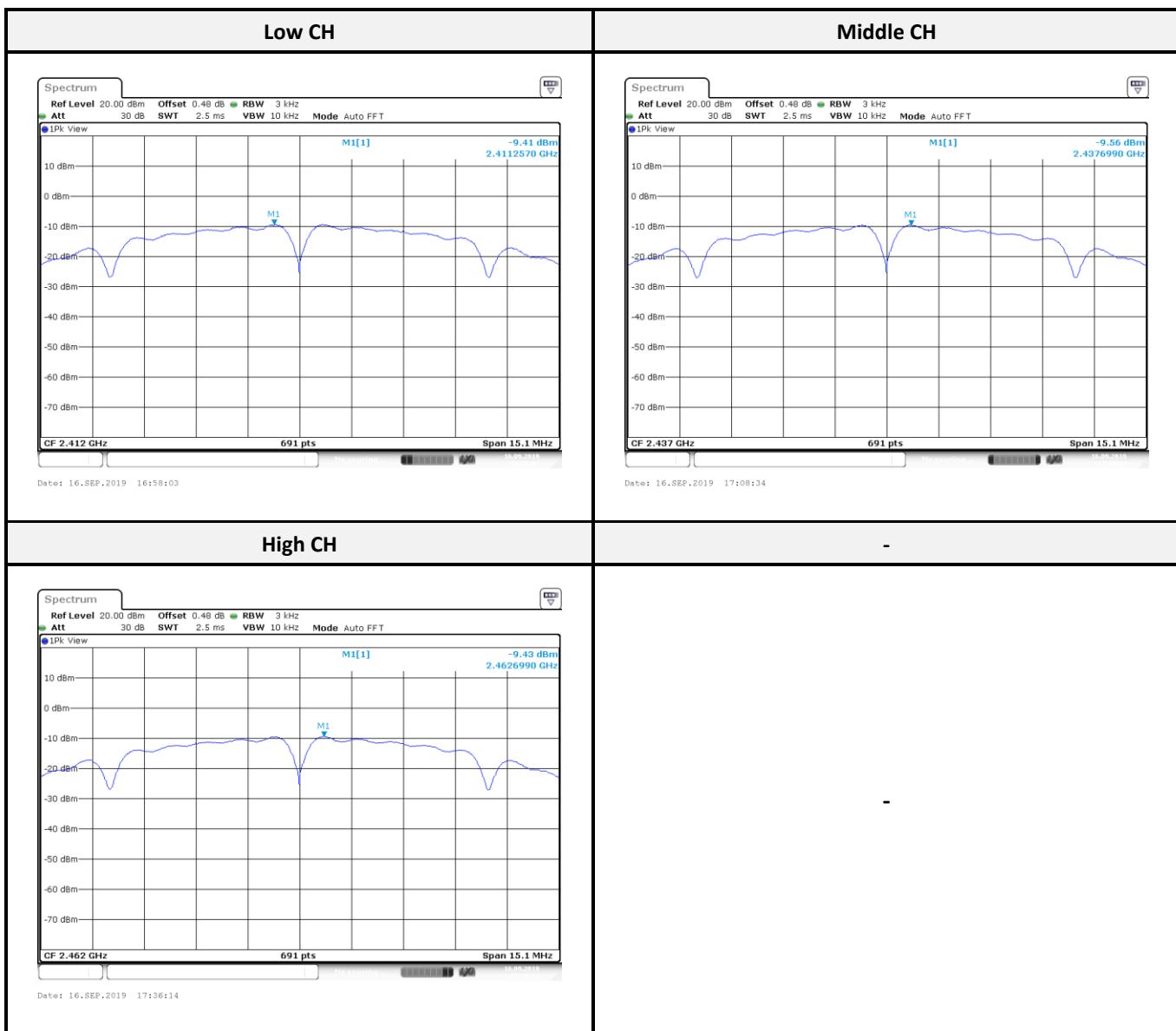
**\*Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

### 12.4 Test Environmental Conditions

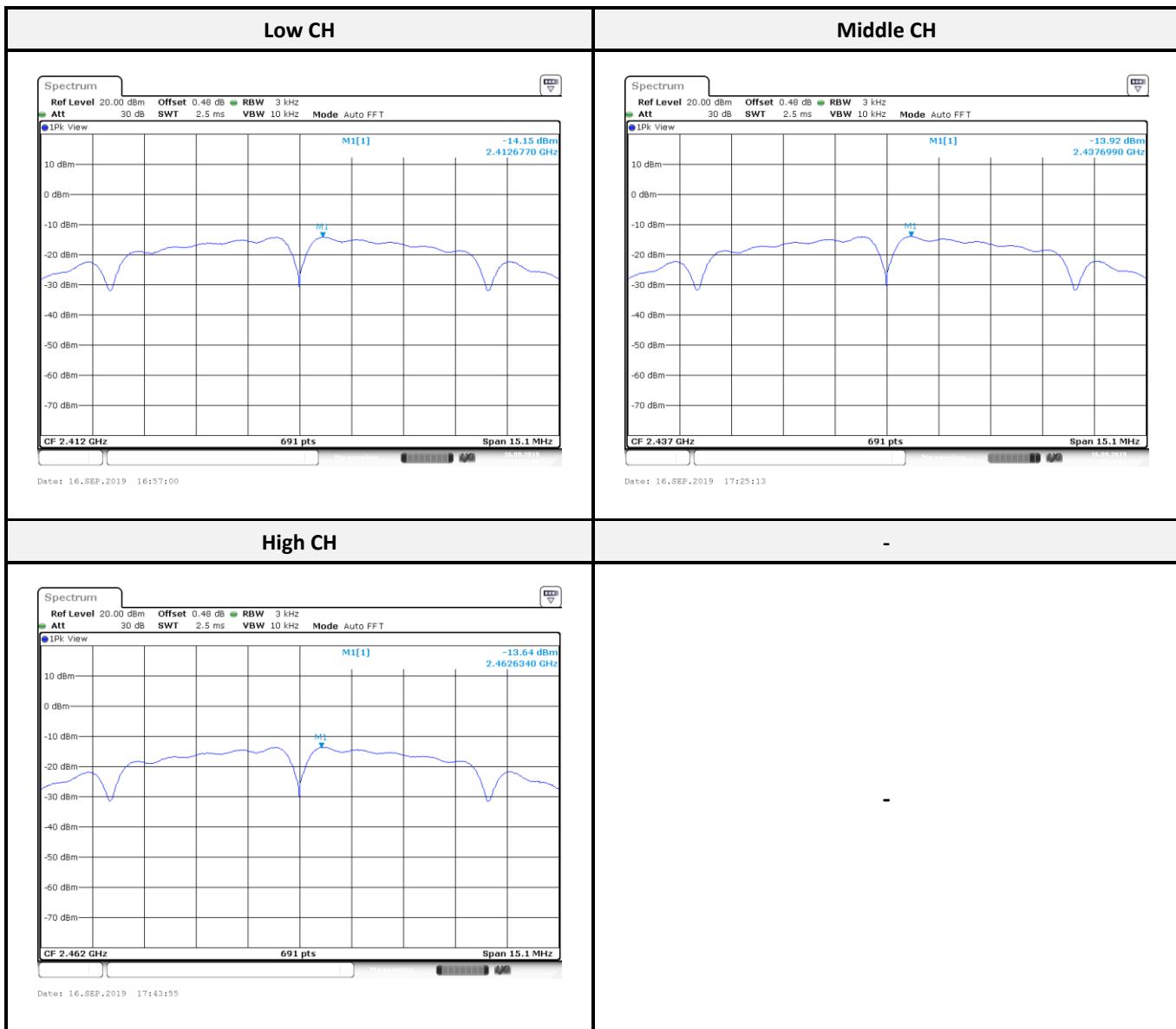
Temperature:	25-5-26.4°C	Relative Humidity:	54-58% RH
Test Date:	2019-09-16 – 2019-09-19	Test Engineer:	Ethan Shao
Test Voltage	120V/60Hz	Mode	Tx mode

## 12.5 Test Results

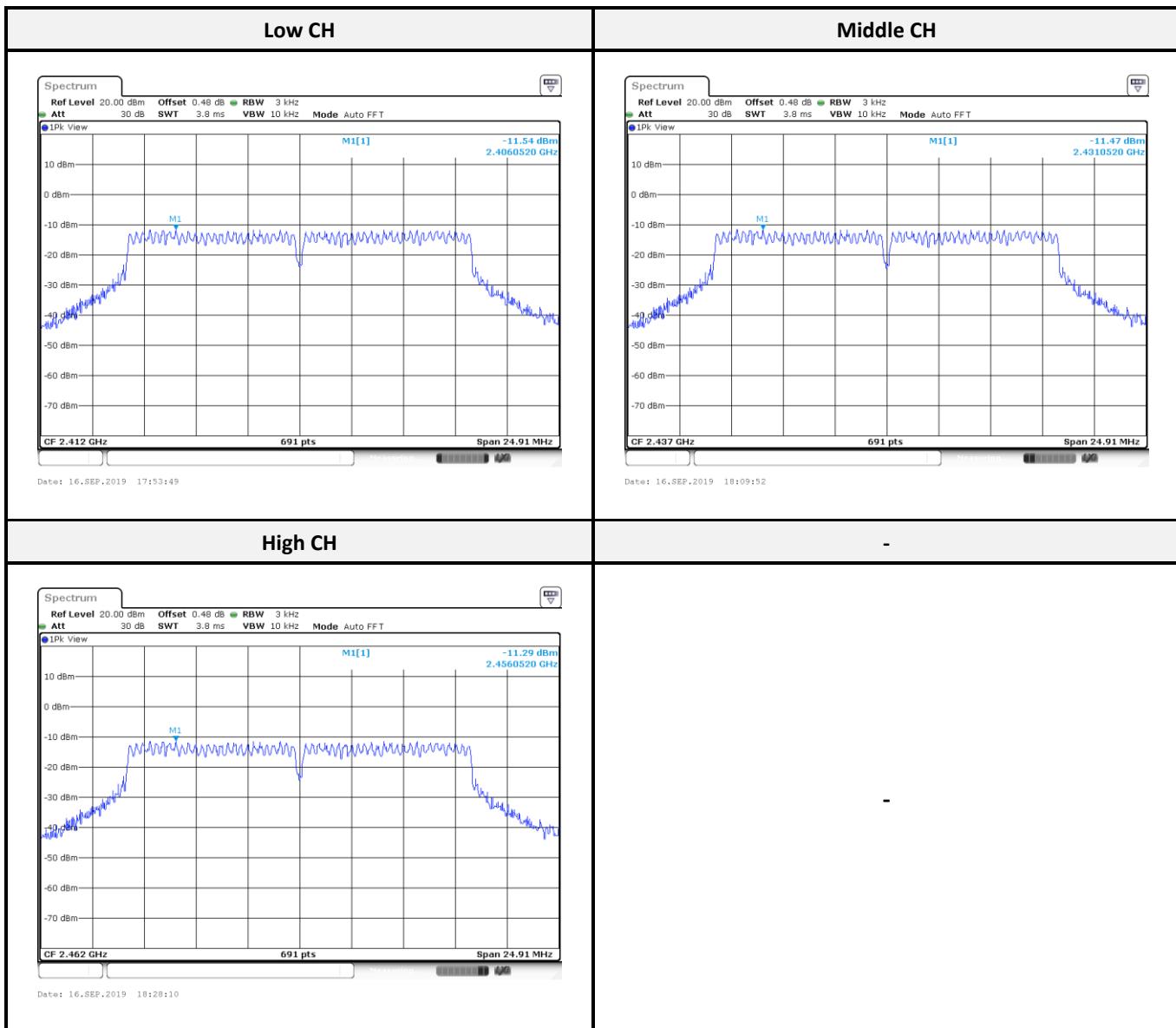
Channel	Frequency (MHz)	Chain0 PSD (dBm/3 kHz)	Chain1 PSD (dBm/3 kHz)	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
<b>802.11b mode Chain0</b>						
Low	2412	-9.41	-	-9.41	8	Compliance
Middle	2437	-9.56	-	-9.56	8	Compliance
High	2462	-9.43	-	-9.43	8	Compliance
<b>802.11b mode Chain1</b>						
Low	2412	-	-11.54	-11.54	8	Compliance
Middle	2437	-	-11.47	-11.47	8	Compliance
High	2462	-	-11.29	-11.29	8	Compliance
<b>802.11g mode Chain0</b>						
Low	2412	-14.15	-	-14.15	8	Compliance
Middle	2437	-13.92	-	-13.92	8	Compliance
High	2462	-13.64	-	-13.64	8	Compliance
<b>802.11g mode Chain1</b>						
Low	2412	-	-14.70	-14.70	8	Compliance
Middle	2437	-	-13.44	-13.44	8	Compliance
High	2462	-	-13.60	-13.60	8	Compliance
<b>802.11n HT20 mode</b>						
Low	2412	-11.40	-11.60	-8.49	8	Compliance
Middle	2437	-10.85	-10.86	-7.84	8	Compliance
High	2462	-9.86	-10.29	-7.06	8	Compliance
<b>802.11n HT40 mode</b>						
Low	2422	-11.51	-11.98	-8.73	8	Compliance
Middle	2437	-11.27	-11.63	-8.44	8	Compliance
High	2452	-11.29	-11.33	-8.30	8	Compliance

**802.11b mode Chain0:**

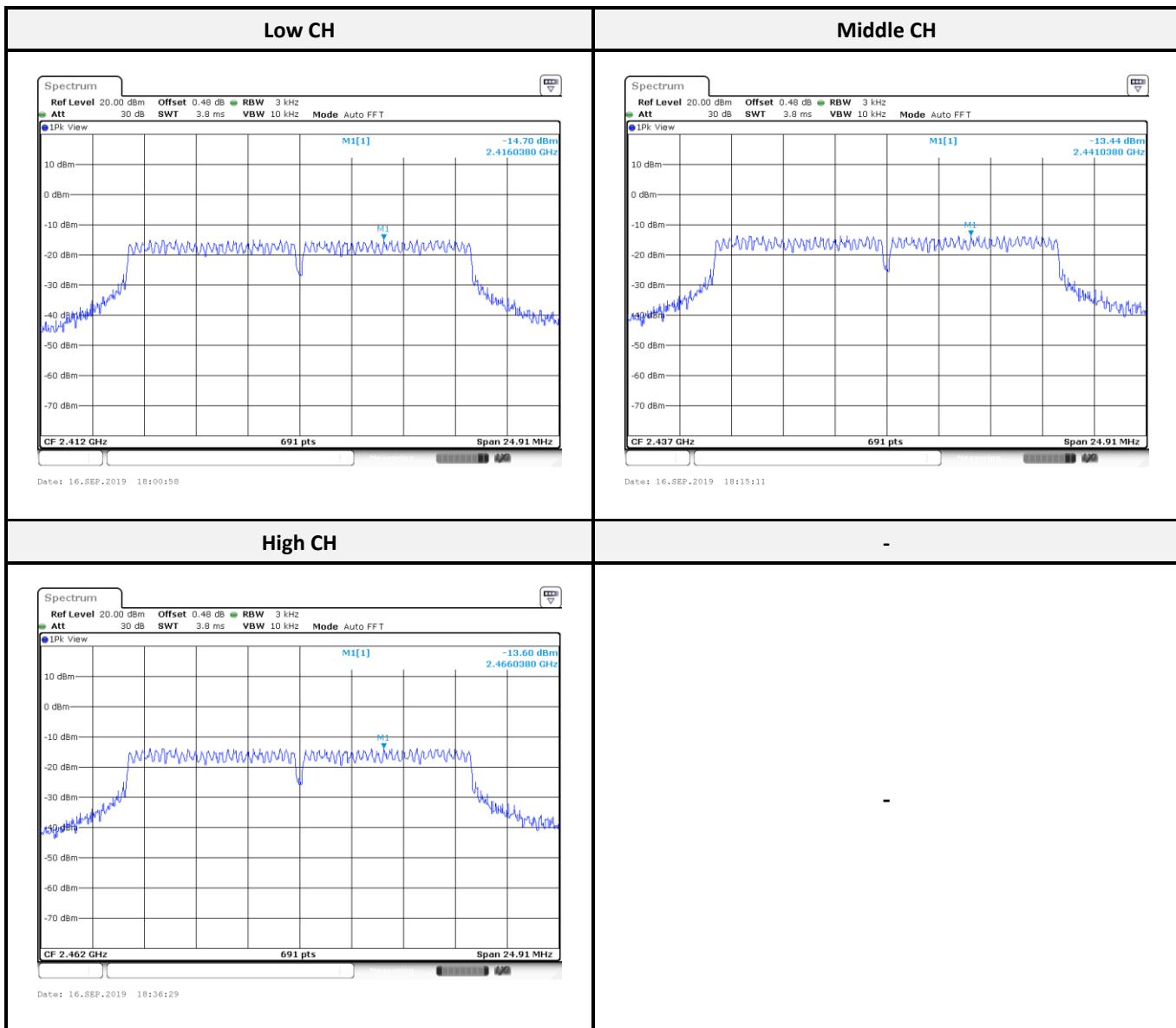
## 802.11b mode Chain1:



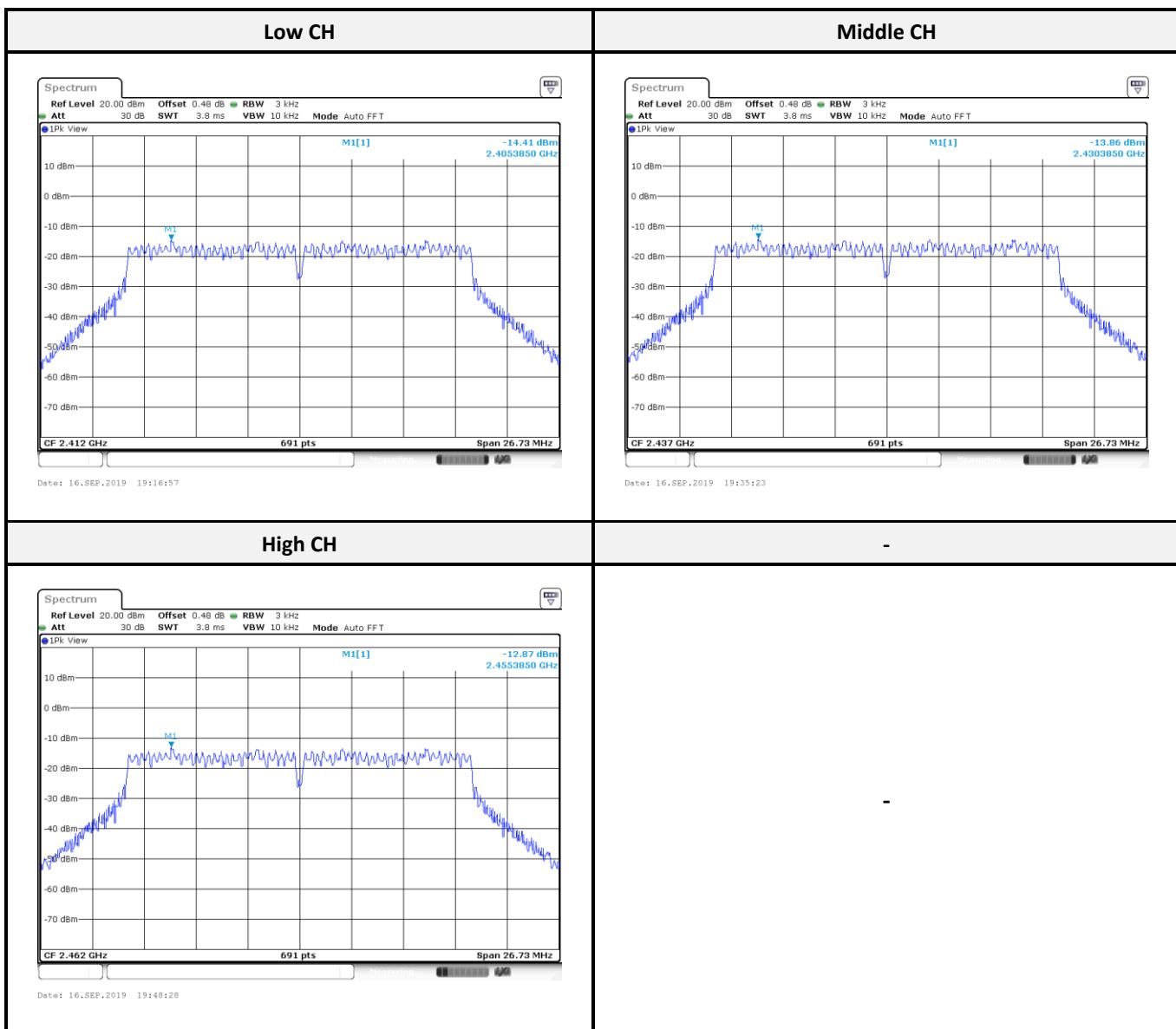
## 802.11g mode Chian0:



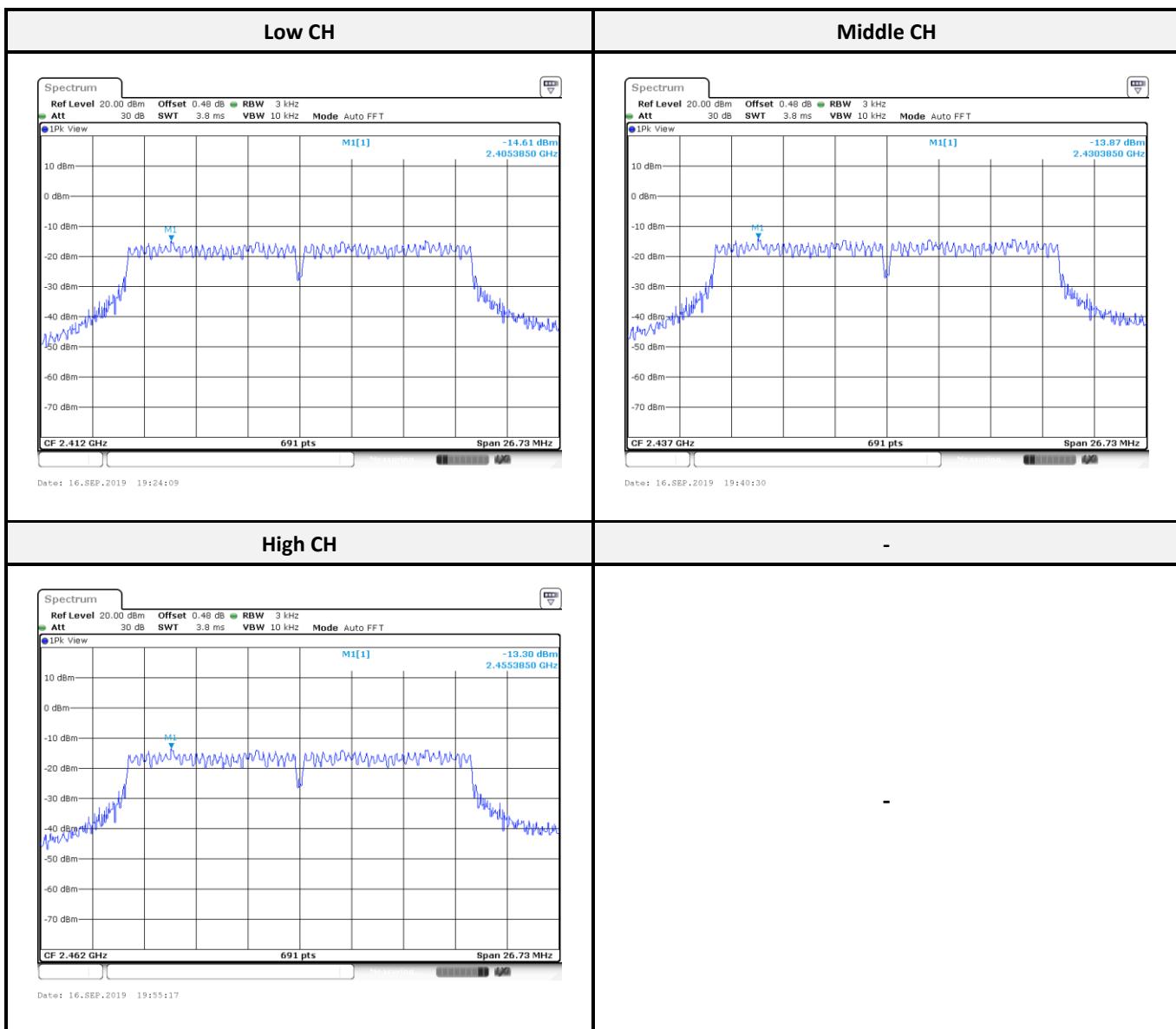
## 802.11g mode Chain1:



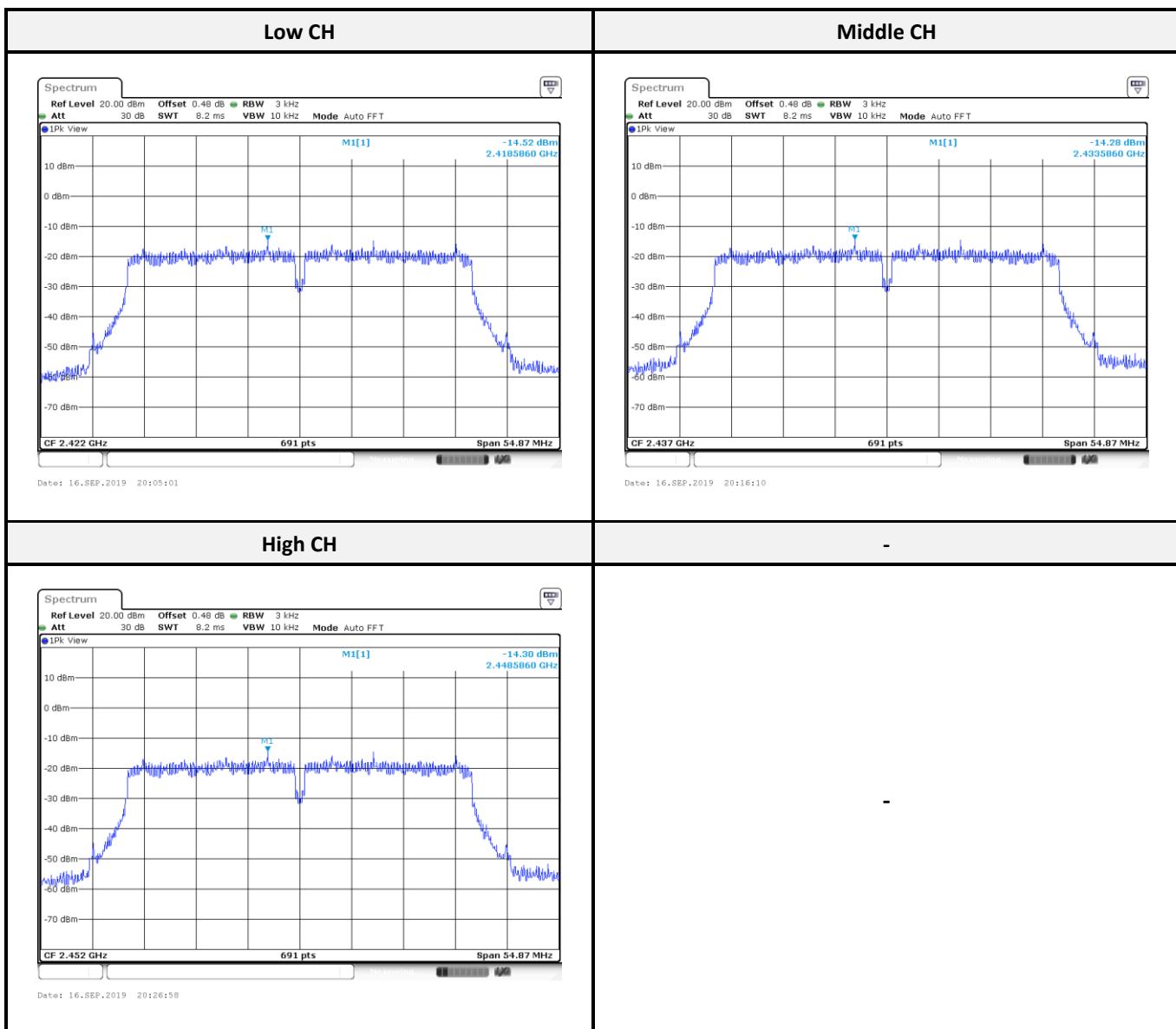
## 802.11n HT20 mode Chain0:



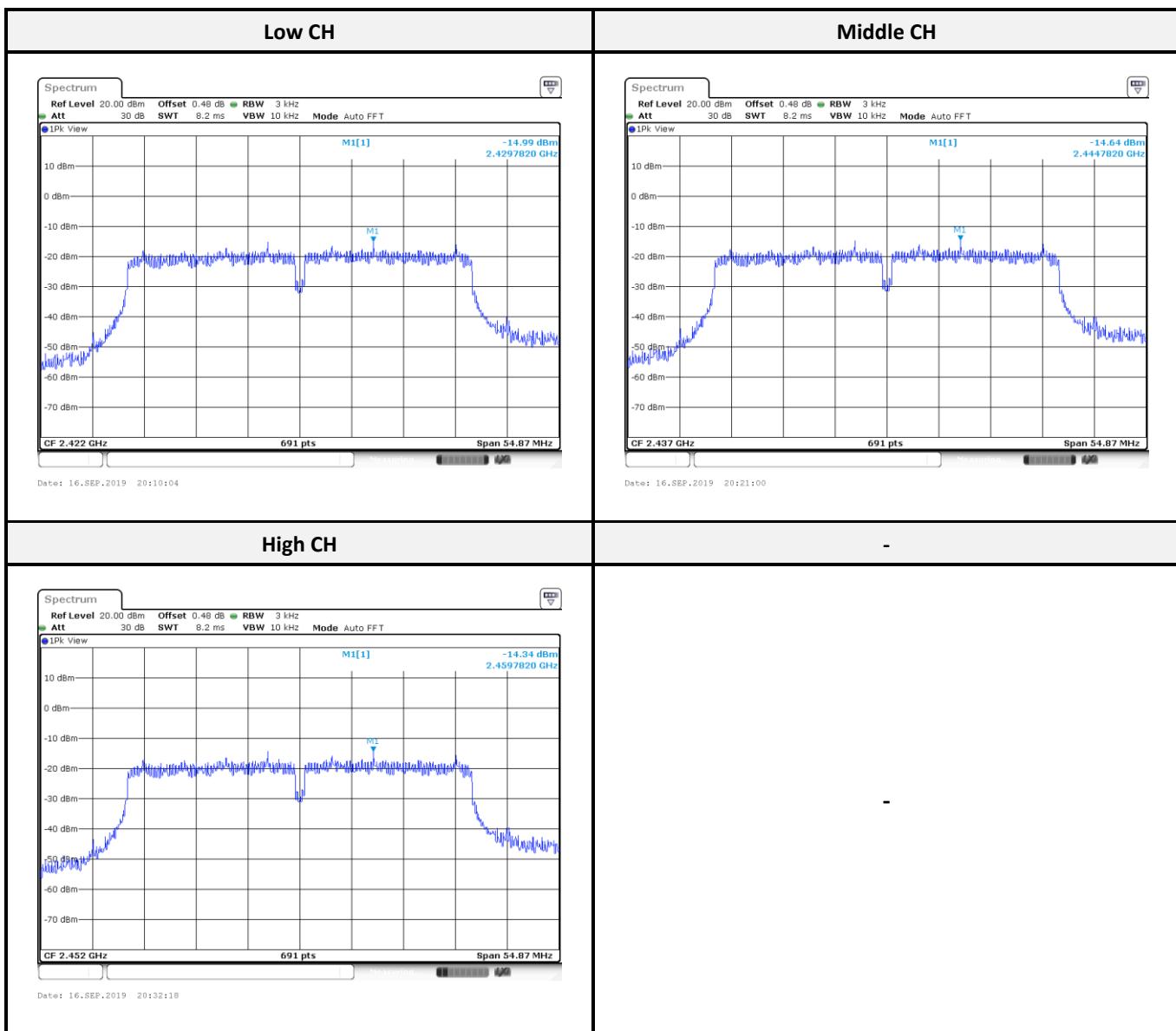
## 802.11n HT20 mode Chain1:



## 802.11n HT40 mode Chain0:



## 802.11n HT40 mode Chain1:



----- END OF REPORT -----